ARCHEOLOGICAL TESTING AT THE SALT CREEK RIDGE SITE (CA-TUL-472)

A Southern Sierra Rock Basin and Bedrock Mortar Encampment on Case Mountain, Tulare County, California

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Abstract

The Salt Creek Ridge Site (CA-TUL-472) is a high-elevation campsite in the southern Sierra Nevada which contains a substantial midden deposit, scattered surface artifacts, rock basins and bedrock mortars. Unfortunately, the site was badly damaged by fire suppression activities during the Case Fire of 1987. As a result of these impacts, CDF authorized a limited testing program to recover and document valuable archeological information before it is lost to erosion or relic hunters. The site was re-recorded, mapped, surveyed and five test pits were excavated. Analysis of these materials indicates the presence of a late-prehistoric complex similar to that identified at Mountain Home Demonstration State Forest, which dates from circa A.D. 1300 to A.D. 1700.

The site is considered to be a significant cultural resource, in spite of its damaged condition, and recommendations to wisely manage it are provided.

The sections written by Eric Kauffman and Richard Jenkins include their name in the Table of Contents. All other sections were written by Daniel G. Foster.

FIGURE 1
View of the Salt Creek Ridge Site looking northwest.
The dirt road crosses a significant cultural deposit shown in the left foreground. Fire-damaged timber can be seen in the background.

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The Case Fire

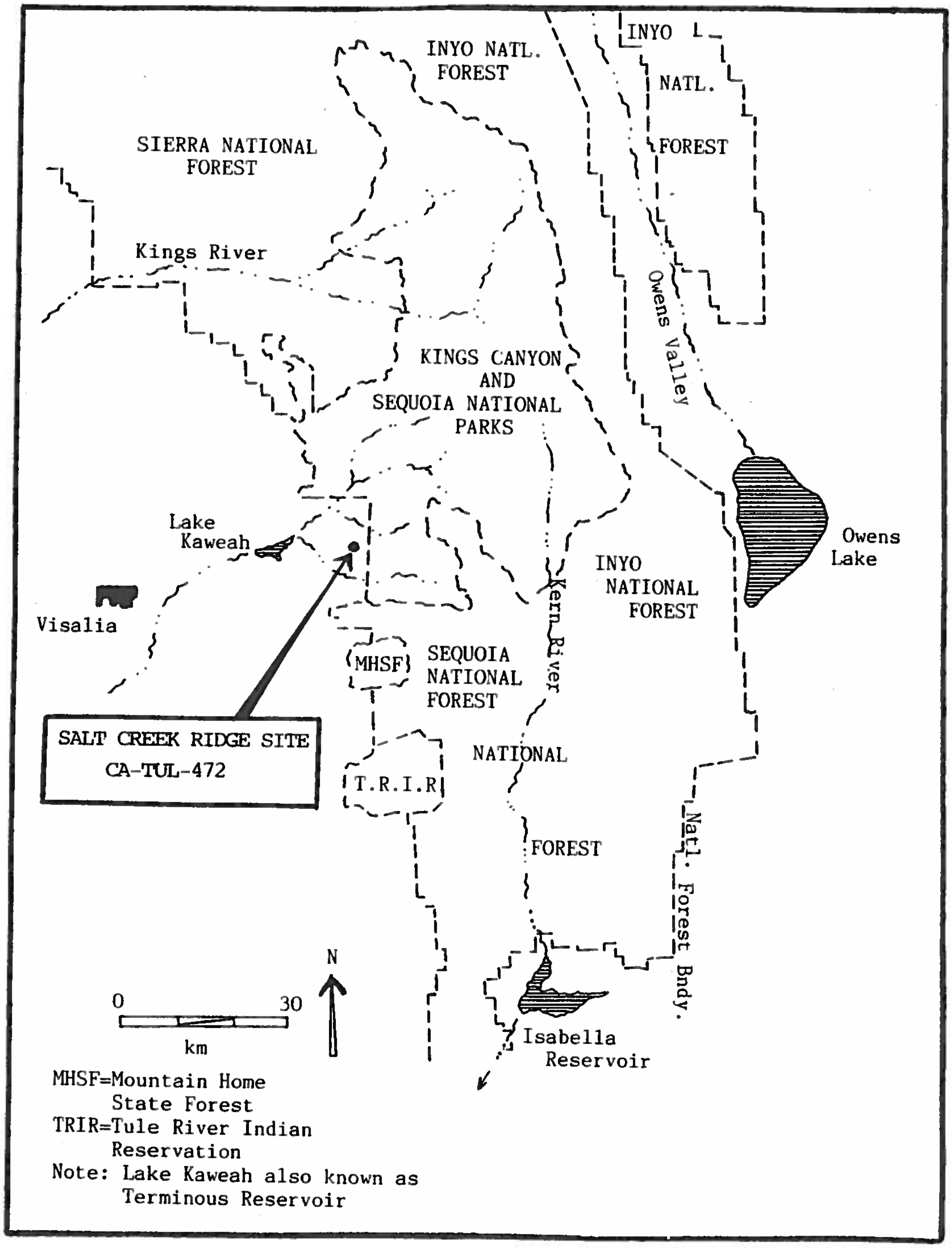
During the summer of 1987, California's forest and range lands were devastated by a siege of wildfires originating from dry lightning storms. During August 29 to September 5, 1244 lightning strikes caused hundreds of large fires which burned nearly 800,000 acres of grass, brush, and timber. In terms of number of acres burned and volume of timber destroyed, 1987 was the worst fire year in the state's recorded history (Phillips and Reinecker 1988:1). One of these devastating fires was the Case Fire, named after Case Mountain and the Case Mountain Grove of Sierra Redwoods in Tulare County. The fire was started by lightning on August 30 and burned 4,723 acres before it was contained on September 7, 1987. Fire suppression responsibilities were shared between the California Department of Forestry and Fire Protection (CDF) and the Bureau of Land Management (BLM) since both private lands and BLM lands were involved.

In an attempt to contain the fire, a wide fuelbreak was planned for construction on the ridgetop called Salt Creek Ridge using numerous bulldozers. The BLM alerted CDF of the presence of an archeological site at Salt Creek Ridge (CA-TUL-472) and efforts were made to avoid the site during fuelbreak construction. BLM Archeologist Duane Christian and six bulldozer operators were on Salt Creek Ridge flagging a dozer-line when a crown-type fire exploded out of the northern gulch rapidly heading for the ridgetop and threatening the safety of seven people. The dozer operators quickly decided to clear a huge area near the archeological site, to dig a "hole" for all six dozers. The seven people were prepared to crawl underneath the equipment and allow the enormous fire to pass over the top of them. Fortunately, the seven individuals were air-lifted to safety by helicopter only minutes before the Case Fire jumped the ridge.

Damage to the Salt Creek Ridge Site

The 4-acre clearing made by the bulldozers caused tremendous damage to the Salt Creek Ridge site. The bulldozers cleared trees and brush from the area and pushed logs and dirt over the edges of the ridgetop. Much of this debris was pushed onto the granite outcrop containing rock basins and bedrock mortars. The midden deposit located adjacent to this outcropping had been scooped up and redeposited in several places. We observed large piles of black, ashy midden in dozer piles and spread out into the clearing. Approximately 17 large conifers were laying across the site when we first saw it.

CDF Forester Lindell Yoshimura was placed in charge of a rehabilitation team to repair damages caused by fire suppression activities during the Case Fire. Tasks included placing water bars across roads, making fuel breaks, stabilizing denuded



map by Eric Kauffman

PROJECT LOCATION MAP

FIGURE 2

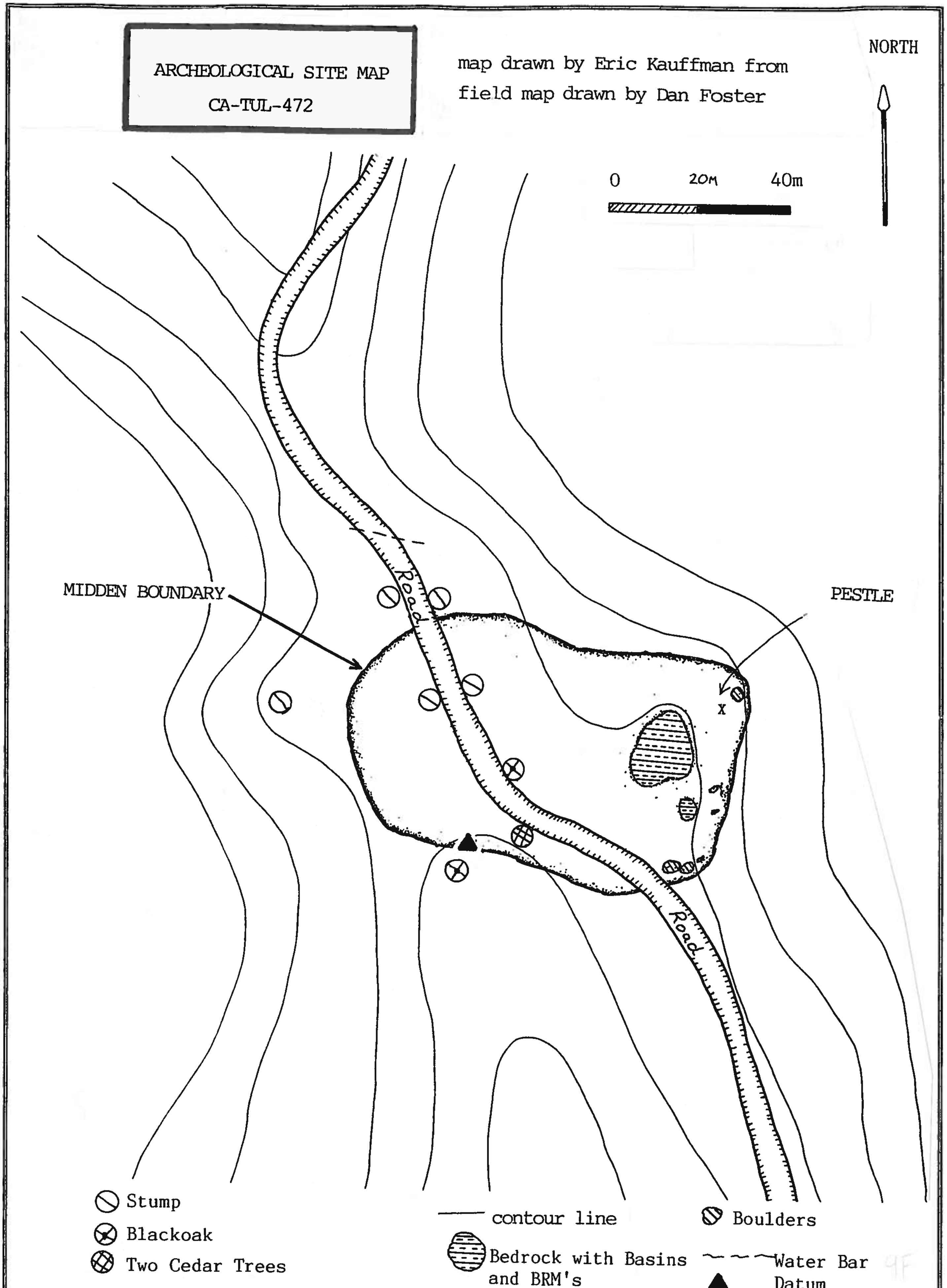
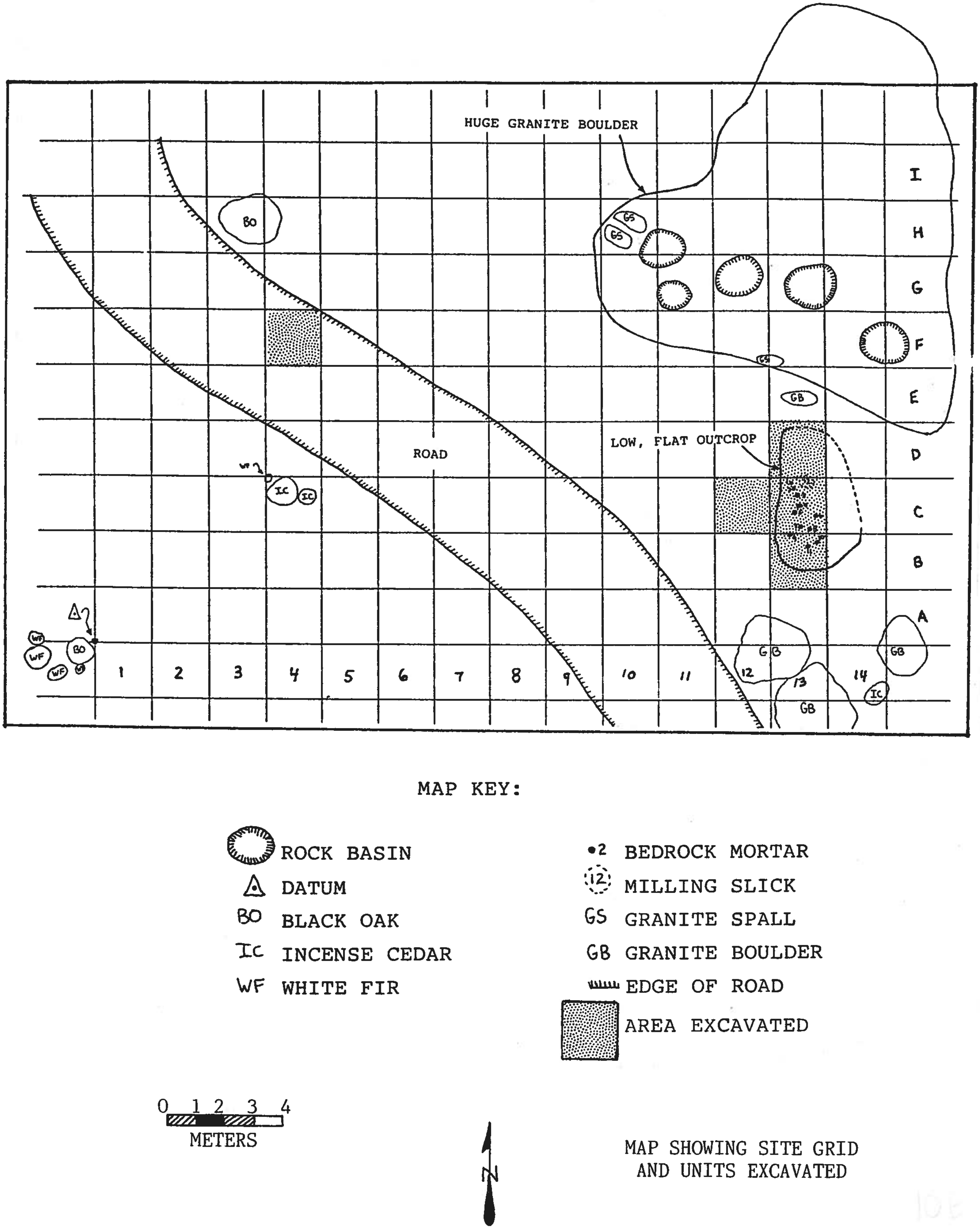

ARCHEOLOGICAL SITE MAP
CA-TUL-472
map drawn by Eric Kauffman from
field map drawn by Dan Foster
NORTH
0
20M
40m
MIDDEN BOUNDARY
PESTLE
Road
Road
Stump
Blackoak
Two Cedar Trees
contour line
Bedrock with Basins
and BRM's
Boulders
Water Bar
Datum

FIGURE 3



MAP SHOWING SITE GRID
AND UNITS EXCAVATED

MAP BY DAN FOSTER FROM FIELD MAP BY RICH JENKINS

FIGURE 4

slopes, sowing grass seeds, building check dams, and repairing damage to the archeological site. Using recommendations provided by the CDF Archeology Office, Mr. Yoshimura, supervising a crew of inmates from Mountain Home Conservation Camp, conducted a clean up operation at the site. All woody material including trees, logs, and brush was cut by inmates into small pieces, piled off the site (by hand) and burned. They were instructed to not use any mechanical equipment and to not move or clear any dirt. The archeological study described herein was then conducted. All fieldwork was undertaken by Daniel Foster and Richard Jenkins from September 22 - 24, 1987.

Purpose of Fieldwork

The California Environmental Quality Act (CEQA), which requires protection for significant archeological sites on private lands during certain projects is not applicable during wildfire suppression activities since emergency projects are exempt. However, since CDF had agreed to BLM's request to protect the site, but was unable to because of the emergency situation described above, the Department authorized a limited testing program at the Salt Creek Ridge Site in an effort to partially mitigate the damage. Our objectives were to:

(1) Re-record the site, improving the topographic map location, and adding to the original record which was quite brief and inadequate.
(2) To lay out a grid for rendering detailed site maps.
(3) To conduct a surface collection of diagnostic materials across the disturbed area.
(4) To excavate the bedrock milling complex and document with maps, photographs, and descriptions the size, shape, and layout of the bedrock milling features.
(5) To obtain a sample of the cultural deposit through careful excavation of several test pits for recovery of artifacts, to understand the development of the midden, the extent of disturbance, and evaluate the significance of this site.
(6) To produce a professional report which documents our fieldwork, artifact analysis and conclusions.

The Original Site Record

The Salt Creek Ridge site (CA-TUL-472), as well as a similar site nearby (CA-TUL-471), were both originally recorded by archeologist Bob Gerry as a result of an archeological survey conducted at Case Mountain (Peak and Associates 1977:4). Strangely, however, he failed to notice the presence of any artifacts, midden, or bedrock mortars--all of which were immediately recognized at the site during our initial inspection. These cultural remains in fact were quite obvious. One possible explanation for the failure of the original archeologist to notice the midden, artifacts, or mortars is that in 1977 these may have been concealed by forest duff. Obviously, the soil visibility was outstanding during our survey since the site had recently been bulldozed. However, Mr. Duane Christian (personal communication 1990) reported that the bedrock mortars were visible prior to site impacts. The possibility that we were dealing with a different site other than the one described by Mr. Gerry was rejected when we could adequately match the layout, size, and description of the five rock basins to those at the Salt Creek Ridge site. There is no doubt that the site we studied is TUL-472 that was originally recorded by Gerry.

As part of this study we have supplemented the original site record including a corrected site location map, prepared detailed site maps, and compiled a more accurate description of the features and artifacts found. This supplement has been formally submitted to the Central San Joaquin Valley Information Center for the California Archeological Inventory, the agency which maintains the official archeological records for Tulare County. It is our intention to restrict disclosure of the exact location of the Salt Creek Ridge Site to the site record for CA-TUL-472 and provide only a general location in this report. This is done so we can publish the report without risk of providing the exact location to unauthorized individuals. Those interested in obtaining the precise location can do so by obtaining a copy of the archeological site survey record for TUL-472.

Environmental Setting

By Eric Kauffman

CA-TUL-472 is located on top of Salt Creek Ridge, which is located in the "transition zone" of in the Sierra Nevada Range at an elevation of 6250 feet. This zone is transitional between the Sierra foothills to the west and the upper elevation highlands to the east. In terms of climate, the western foothills are categorized as a Warm Mediterranean, where the temperature in the winter averages above freezing and most of the precipitation comes as rain (Donley et al. 1979:137). In the transition zone, which is generally higher in elevation than the foothills, the climate is a Cool Mediterranean with the warmest month averaging below 22°C (Ibid). Additionally, transition zone precipitation is mostly in the form of rain, with some snow in the upper elevations. To the east of the transition zone, in the higher elevation areas, the climate is Microthermal (Ibid). Microthermal temperatures average below freezing during the coldest month of the year, and most of the precipitation arrives as snow during the winter.

In actuality, all three climates are not homogeneous--especially the transition zone where rugged topography and slope aspect mix the foothill and microthermal climates together. Topographic elevations in the transition zone range from 600 feet in the valleys to 6500 feet on mountain and ridge tops. In the transition zone where the valleys and south facing slopes occur, Foothill-like climates are found. Conversely, the Microthermal-like climates are found on the ridge crests, mountain tops, and

LIST OF PLANTS OBSERVED BY DAN FOSTER AND RICH JENKINS IN THE VICINITY OF CA-TUL-472

Plant Name (Common)	(Scientific)
Sierra Redwood	Sequoiadendron giganteum
Ponderosa Pine	Pinus ponderosa
Sugar Pine	Pinus lambertiana
Douglas Fir	Pseudotsuga menziesii
White Fir	Abies concolor
Black Oak	Quercus kelloggii
Scrub Oak	Quercus dumosa
Live Oak	Quercus chrysolepis
Big Leaf Maple	Acer macrophyllum
Alder	Alnus Rubra
Elderberry	Sambucus sp.
Wild Grapes	Vitis californica
Buckeye	Aesculus californica
Chamise	Adenostoma densifolium
Yerba Santa	Eriodictyon sp.
Manzanita	Arctostaphylos sp.
Coffee Berry	Rhamnus californica
Ceonothus	Ceanothus sp.
Rabbit Brush	Chrysothamnus sp.
Prunus	Prunus sp.
Mountain Misery	Chamaebatia foliolosa

FIGURE 5

north facing slopes. In other words, the foothill climate extends eastward into the transition zone by following the valleys, and the highland climate extends westward along the ridge lines and mountain tops--the result is a mix of warmer and cooler microclimates.

This mosaic of micro-climates affects the vegetation cover. In the valleys, such as the Kaweah River drainage, the predominant vegetation community is Oak-woodland with a riparian belt along the water-course. This lowland area is characterized by blue oak, interior live oak, California buckeye, and bunch grass (Fee 1980:6). Slightly higher in elevation (such as the lower slopes of Case Mountain, Salt Creek Ridge, and slopes of the Kaweah River Canyon), there are patches of Chaparral (Fee 1980:6). In the upper elevations above the the valleys, including Case Mountain and Salt Creek Ridge, the vegetation is considered a Mixed Conifer Forest (Griffin and Critchfield 1976:7; Fee 1980:6). Several different pine species, fir, and oaks occur in this community. Additionally, groves of giant sequoia are common between 3000 and 8000 feet in elevation.
Figure 5 provides a list of plants which occur near the site.

Ethnographic Background

By
Eric Kauffman

This site appears to be located near the boundary between the Patwishia group of the Monache, and the Wikchamni group of the Foothill Yokuts (See Fig. 6). Several researchers have conducted ethnographic work in this region. They include Blount et al. (1984), Gayton (1948), Gifford (1932), Kroeber (1925), McCarthy et al. (1985), and Spier (1978a, 1978b). While these ethnographers were not able to record everything that was known about the aboriginal people of the southern Sierra, their research has provided evidence that is particularly useful in interpreting the occupation at TUL-472. This evidence is summarized below.

Location of Core Settlements

In general, southern Sierra ethnographic work suggests that almost half of the major settlements are located between the 2000 feet and 3000 feet elevation along the major waterways (Blount et al. 1984). However, this distinction does not necessarily apply for the Patwishia and Wikchamni. The majority of Patwishia apparently lived in large villages along the East Fork of the Kaweah River and at the confluence with Salt Creek; that area is from 650 to 2000 feet in elevation. The Wikchamni, a Foothill Yokup group, lived down river from the town of Three Rivers, which is at 650 feet in elevation (Spier 1978). It seems that the core settlements of both these groups were below 2000 feet.

14B

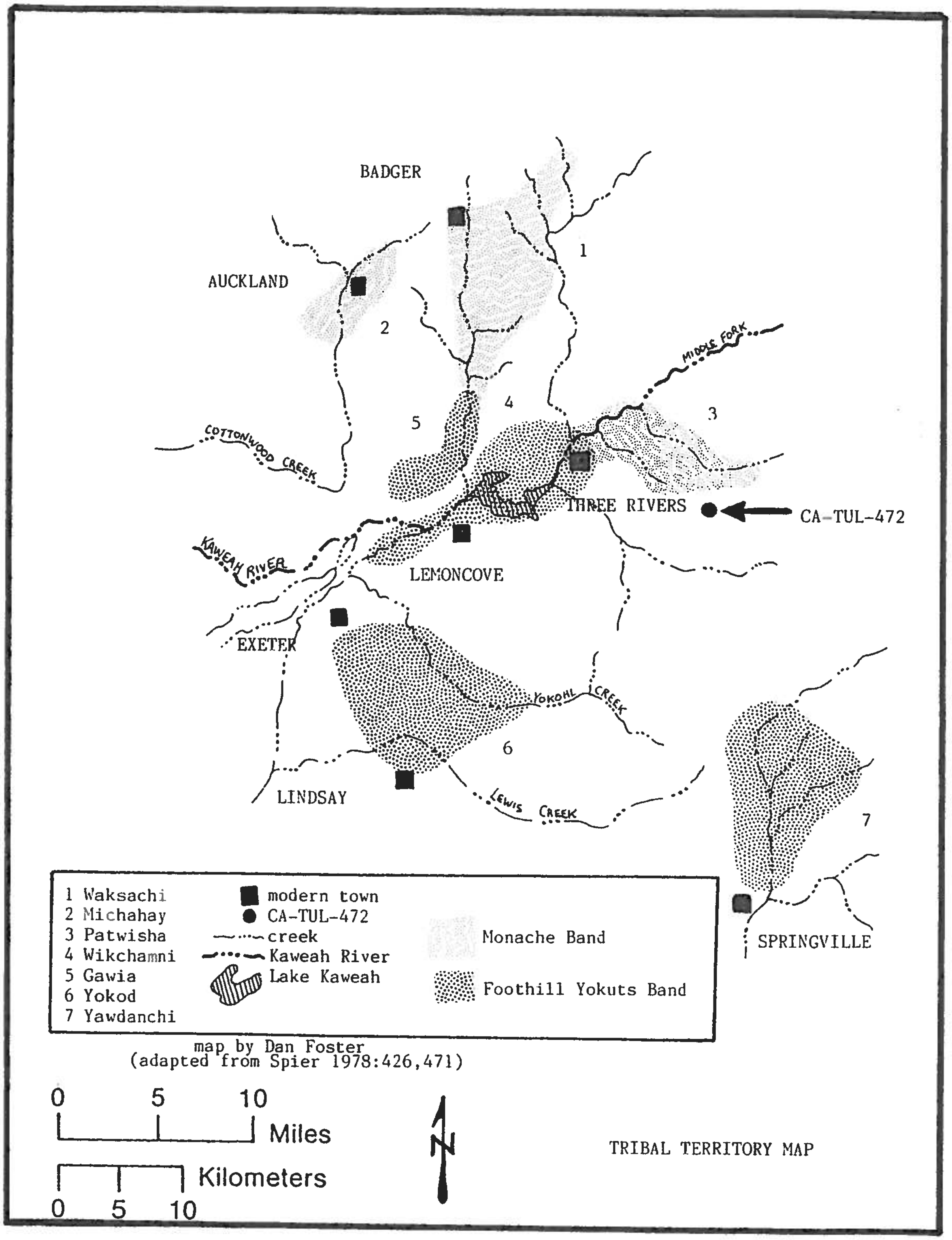

BADGER
AUCKLAND
1
2
3
4
5
6
7
MIDDLE FORK
COTTONWOOD CREEK
THREE RIVERS
CA-TUL-472
KAWEAH RIVER
LEMONCOVE
EXETER
YOKOHL CREEK
LINDSAY
LEWIS CREEK
SPRINGVILLE
1 Waksachi
2 Michahay
3 Patwisha
4 Wikchamni
5 Gawia
6 Yokod
7 Yawdanchi
modern town
CA-TUL-472
creek
Kaweah River
Lake Kaweah
Monache Band
Foothill Yokuts Band
map by Dan Foster
(adapted from Spier 1978:426,471)
0 5 10
Miles
Kilometers
0 5 10
N
TRIBAL TERRITORY MAP

FIGURE 6

Seasonal Travel and Exchange Patterns

The Kaweah groups were known to travel through each other's territory on their way to the highlands or the foothills. For example, according to Kroeber (1925:479-480), several Yokut groups made trips to locations near Lake Kaweah and Case Mountain:

> In spring and early summer they gathered seeds in the vicinity of Lindsay; in late summer or fall they met with other tribes... about Porterville for fishing and elk hunting.... All the Yokuts tribes from the Kaweah River south, except perhaps the Wowol and Chunut of Tulare Lake, and at least most of the adjacent Shoshoneans, were friendly and appear to have ranged over one another's territory amicably and almost at will. ... The Wukchamni, Wikchamni, or Wikchomni... wintered on Kaweah River near Lemon Cove and Iron Bridge and frequented the adjacent hills in the summer (Kroeber 1925:479-480).

Lemon Cove is located near Lake Kaweah, and the "adjacent hills" would probably be in the vicinity of Case Mountain--which means TUL-472 might have been visited by Yokuts.

While the Yokuts were known to visit the mountains adjacent to their foothill and valley homeland, the Patwishia also made forays into the highland areas to trade with the Eastern Mono,

> Their [Monache] pursuit called for seasonal movements to various elevations on the Sierra slopes. The Northfork Mono also visited the eastern slope of the Sierra to gather pine nuts, while other Monache traded with the Eastern Mono to secure the nuts (Spier 1978b: 427; brackets inserted).

Because TUL-472 is located along a ridge that could have provided access to the highlands, it is conceivable that the site might have been visited by Patwishia; indeed, their winter settlements are located immediately north of TUL-472.

In terms of intergroup trade, all ethnographic groups in the area had extensive contacts with each other (Spier 1987a, 1978b, Fee 1980, Blount et al. 1984). The Foothill Yokuts were known to trade acorns, bark baskets, shell beads, and other times with the Monache, who reciprocated with rabbit-skin blankets, pinon nuts, moccasins, and other items (Fee 1980:22). Both the Monache and Yokuts traded with the Owens Valley Mono who returned obsidian, pine nuts, and other material objects (Ibid).

Subsistence Strategies

The Patwishia and the Wukchamni depended mostly upon plant foods, hunting, and fishing. Important plant foods for both groups included acorns, pine nuts, and manzanita berries (Spier 1978a:429, 1978b:428-429). To a lesser degree, grass seeds, roots, and insects were also eaten. The most favored acorns were from black oak trees, followed in preference by white oaks, blue oaks and live oaks (Fee 1980:18).

Plant Food Milling Activities.
Acorns, seeds, and berries were processed using a stone tool kit consisting of bedrock mortars, milling slicks, pestles, and handstones. A typology of the different bedrock milling surfaces was developed by McCarthy, Hicks, and Blount (1985). Their research was based on the testimony of northern Monache informants. In essence, the northern Monache typology stratified the milling surfaces into four categories of: (1) starter mortars, (2) finisher mortars, (3) seed mortars, and (4) flat processing surfaces. After conducting additional research, the mortars were found to group with astonishing regularity into the categories predicted by the informants (1984:343).

The starter mortars are shallow, the finisher mortars are deeper, and the seed mortars are the deepest. McCarthy et al (1984:312, 314-7) described how each class of milling feature was used:

[Acorns: Initial Cracking and Peeling]

> The acorns to be cracked were placed in an anvil stone and struck at the stem end with a hammerstone. The steatite anvil used by the consultant was about six inches in diameter, with a number of small pits to hold the acorn.... The hammerstone was of a harder material, possibly granite. It was flattened, smoothed on two sides, and fit comfortably in the consultant's hand.
>
> After [cracking] a large number of acorns...the split hulls were removed by hand.... The...next step was to remove the reddish skin from the meats....

[Acorns: Starter Mortars]

> Pounding began in a shallow mortar (defined in the model as a "starter mortar"). Pounding was done with a large, unshaped, triangular pestle [with]...battering marks on the business end.

[Acorns: Finishing Mortars]

> The shift from starter to finishing mortar was...accomplished by...sweeping the partially crushed meal to the nearest deeper mortar, using [a] soaproot brush.... A larger pestle, narrower at the bottom than the starter pestle, was chosen for this phase of the pounding.
>
> The reasons given by all consultants for the use of the deeper mortar was that final pounding requires more force, resulting in more acorn pieces flying out of the shallower hole.

[Seed Mortars]

> Generally, seeds were said to have been crushed against the sides of the deepest mortars. A special long, narrow pestle was manipulated in a slow, circular motion.
>
> Sour berries were also pulverized using this same technique, although the object was not to produce flour but rather to crack the skins, barely crushing the fruit.

[Flat Milling Surfaces]

> Two consultants stated that manzanita berries were treated in this same fashion [however]...some groups chose to crack dried manzanita berries on a smooth, flat granite surface, using only light pressure from a small loaf-shaped mano or smooth, flat cobble. The surface chosen was... not a ..."metate" slick, but rather a very flat and smooth spot <u>[which] produced no alteration of the rock surface</u>.

<u>Hunting</u>

While plant foods were important for the Foothill Yokuts and the Monache, hunting was also a significant source of food. Deer were hunted with bow and arrow in conjunction with several different hunting strategies including "stalking in a disguise, ...driving into an ambush, ...tracking a deer until it became exhausted, and ...trapping with a spring-pole device that caught the deer by the leg" (Spier 1978a:427).

Quail were also hunted or trapped. Here is how the Yokuts caught the bird (Spier 1978b:472):

> A fence, like a miniature stockade, was made of sticks closely set in the ground and extending upward to a height of a few feet. Noose traps, powered by a bent stick under tension, was set in opening in the fence at intervals of 20 to 50 or more feet. The ground-feeding quail would attempt to walk through these openings rather than fly over the obstacle across their path. These fences, reported as having been as long as a mile, yielded a good supply of birds when regularly patrolled.

The Monache were reported to hunt bears by "rousting them from caves" in the springtime (Spier 1978a:428). Poles were held across the entrance to the cave while a hunter shot the bear with an arrow. Other times, a lone hunter would build a blind in an oak tree where a bear feed. He would occupy his blind in the evening and wait there all night until the bear returned the next morning, when he killed it by shooting it with an arrow (Ibid).

The outline presented above, although rough, can help us interpret the occupation of TUL-472. First, taking into account the traveling nature of these people, it is conceivable that either the Wichamni or the Patwishia, or their neighbors could have occupied the site. Second, while major settlements were located in the core areas strewn along the Kaweah River, temporary camps were located in higher elevations away from the major water courses. Thus, TUL-472 undoubtedly was a seasonal camp. Third, both ethnographic groups relied upon collecting acorns, gathering pine nuts, and hunting--all of which could have taken place at or near the site.

Site Description

CA-TUL-472 is located in the southern Sierra Nevada approximately 40 kilometers east of Visalia and is situated in a saddle on Salt Creek Ridge above the 6000 foot elevation (Fig. 2 and 6). The site is located largely on the east side of the ridge, sheltered from the prevailing westerly winds, in a forest opening. The immediate site area is sparsely vegetated with mixed conifers including white fir, incense cedar, black oak, and Sierra Redwoods.

Site dimensions, based on the extent of culturally derived dark midden soils, were measured as 55 meters north-south by 90 meters east-west. Dimensions prior to ground disturbing activities associated with fire suppression may have been somewhat smaller. The depth of the cultural deposit was determined to be 30 cm at minimum during test excavations and appears deepest near a food processing station in the southeastern site area, perhaps exceeding 80 cm, although much of the upper portion of the deposit is disturbed overburden.

The dominant feature of the site, and perhaps the singlemost important resource for selecting this area for occupation is a granite boulder complex. Present are 6 boulders averaging 1 - 2 meters in diameter, a large outcrop measuring roughly 12 meters square that contains 5 so-called "Indian Bathtubs" (discussed in Appendix 2), and several granite spalls. Also present is a partially buried outcrop measuring 3.5 x 1.5 meters containing a food processing station.

The food processing station is an interesting feature of the site. A minimum of 12 milling features including conically shaped mortars, round-bottomed mortars, milling basins, milling basins with round-bottomed mortars, and polished grinding slicks were documented. The dimensions and shapes of milling features are displayed on Figures 18 and 19.

There are five rock basins at the Salt Creek Ridge site and a small pit which could be an incipient sixth basin. The five large basins are well-formed and similar to rack basins found elsewhere in eastern Tulare County. They are oval, saucer-shaped depressions which range from 90 to 150 cm in diameter and

19F

up to 100 cm deep. As is a common pattern elsewhere, four of these basins are on a common alignment which is a remarkable trait of the southern Sierra group. These basins occur on the upper horizontal flat surface of a huge granite boulder immediately north of the bedrock milling complex.

Data Recovery Methods

by Richard C. Jenkins

The initial phase of the project entailed the establishment of a grid system overlying the site area. A permanent datum was installed using a metal rod set in the ground adjacent to a black oak tree. Using stakes and string an east-west grid axis was marked with the alphabetic designators A-I and a north-south axis with numeric designators 1-14. The result was the establishment of 140 two by two meter square grid units each referenced by a combination alphabetic/numeric code (see Fig.4). Two methods of data collection were employed during the project. The first entailed the collection of artifacts clearly visible on the site surface. Artifacts were flagged and later examined for relative significance. Diagnostic artifacts and those possessing future research value (such as obsidian specimens for hydration and source analysis) were bagged and labeled with the appropriate grid coordinates.

Data was also collected by excavation with trowel and shovel. Four grid units were chosen for an area that contained dark midden soils on and adjacent to a bedrock food processing station. Another was selected along the road in hopes of recovering the steatite vessel fragments related to surface finds. Loose overburden soils were shoveled and screened through 1/4 in mesh. Intact soils were troweled in arbitrary 10 cm levels and screened through 1/8 inch mesh. Artifactual materials were bagged according to grid unit and level. All units were backfilled upon completion of the project.

Description of Artifacts Recovered

A total of 218 artifacts were recovered during the fieldwork and a description of these items appears below. These categories of artifact types were determined based upon function, form, and material types. Figure 7 is a table showing the artifact recovery by unit. Unit C-12 was particularly rich having produced 128 of the total (58%). This is due to the fact that the unit contained a relatively deep portion of the deposit. Other units produced fewer artifacts because the volume of excavated midden was considerably smaller. Unit C-13 for example, produced only 30 artifacts, but was chosen for excavation in order to expose the bedrock mortar features partially buried. Relatively little midden was excavated here.

In general, the collection is rather typical for southern Sierra archeological sites with obsidian flakes and pot sherds the most common artifact present. Also, the presence of rough, percussion-flaked basalt cores and angular chunks seems to fit

TABLE SHOWING ARTIFACT RECOVERY BY UNIT

ARTIFACT TYPE	UNIT DESIGNATOR									TOTAL RECOVERED
	B-13	C-12	C-13	D-12	D-13	E-9	F-6	G-17	*	
Manos		3	1						2	6
Pestle								1		1
Metates		1			1					2
Soapstone Bowl Fragments		1					1			2
Ceramic Pot Sherds		28	5		2	2	5			42
Obsidian Projectile Points	1	5	1		1					8
Obsidian Biface Fragments		2					1			3
Hammerstone							1			1
Basalt Core Tools (Choppers?)	1	1								2
Obsidian Microdrill	1									1
Obsidian Flakes	7	50	14	1	10		8			90
Large Flake Tools (Scrapers?)		1					1			2
Large Basalt Core Reduction Flakes	2	8					1			11
Small Basalt Interior Flakes	4	19	5							28
Quartz Flakes		2	3		1					6
Metavolcanic Flake					1					1
Jaspar Flake					1					1
Burned Bone Fragments		7	1		1		1			10
Bullet Casing					1					1

Total Number of Artifacts Recovered 218

* Items collected and cached by BLM Archeologist; provenience unknown

FIGURE 7

the pattern for late-prehistoric assemblages of this type. The presence of a micro-drill, relatively rare, is a significant discovery. Also, the presence of 8 projectile points in such a small sample is a remarkable feature of this assemblage.

Manos (6)

Six handstones were recovered during the excavation and surface collection. Two are whole specimens, one is nearly complete, one is broken in half, and two consist only of small fragments. Four are fashioned from granite while the remaining two are made of andesite. Three manos are oval-shaped, finely-pecked forms with both large surface worn smooth from grinding. These types of handstones are commonly found at archeological sites with the southern Sierra Nevada. The largest of this type measures 114 x 80 x 48mm. A small pit 26mm in diameter and 3mm deep has been pecked-out from the center of one ground surface. A single, complete example of a different type of mano is also present. It is a multi-faceted, shaped granite cobble which bears three ground surfaces and measures 98 x 83 x 57mm. This mano has two typical ground surfaces on the largest and flatest surfaces as well as an unusual third utilized end surface. The opposite end also has a pecked pit measuring 18mm in diameter by 3mm deep.

Pestle (1)

A single, complete granite pestle was found on the surface, below the ridgetop, immediately northest of the rock basins. Made from a large triangular cobble, this pestle exhibits little shaping except at its distal end from use in a bedrock mortar. The overall dimensions are 242mm long, 140mm wide, and 72mm thick. The flattened tip measures 36mm x 43mm. Its weight, shape and size suggests that it was yielded with two hands and the wear pattern on the distal end suggest it was employed in one of the deeper conical mortars, since there is considerable evidence of grinding on the sides of the lower portion.

Metates (2)

Two small groundstone tool fragments exhibiting a single polished surface are thought to be possible metates. The smallest fragment measures 20mm x 17mm x 7mm and is made of metamorphic stone. This type of material was not seen in the site area and must have been imported. The other possible metate is the rim fragment piece of a large, flat, wide granite basin with a single ground surface. It measures 74mm x 50mm and is 49mm thick.

Soapstone Bowls (2)

Two fragments from two different soapstone vessels were recovered during our excavations. One of the fragments (actually found in three pieces but glued together) is rather large, forming nearly 25% of the entire vessel and therefore allows us to reconstruct the approximate size and shape of the complete form. From rim to rim, its diameter was probably 190mm and 105mm from base to rim. It is 6mm thick. The interior surface exhibits deep random scratches, presumably caused during its manufacture. The exterior is finely polished with only fine manfucturing scratches still visible. A 56mm length of the vessel's rim is present on this large bowl frgment. It has been decorated with a series of incisions cut into the rim surface. The incisions are 1.5mm wide and V-shaped suggesting they were cut with a stone biface (see Fig. 14).

A second tiny rim fragment from a smaller soapstone vessel also exhibits decorative incisions cut into the rim surface. This vessel was approximately 100-130mm in diameter but thinner-walled. It is 4mm thick.

Ceramic Pot Sherds (42)

A good number of pot sherds, 42 in all, were found during the excavations and surface collections. These are small fragments of thin-walled vessels of a plain brown ware (Owens Valley Brownware). The sherds appear to have been tempered with sand or decomposed granite and range in size from 6mm x 8mm to 54mm x 42mm. Most are 3mm thick.

Several fragments of a much larger, thick-walled vessel are also present. These are 5mm thick at the rim, and 8mm thick in the sidewalls. These large sherds appear to have been tempered with fine sand including specks of mica.

Unlike the soapstone bowls, decorative incisions are absent from rim sherds of both sizes of vessels.

Obsidian Projectile Points (8)

Eight (8) small obsidian projectile point fragments were recovered. Five of these are sufficiently complete to classify into two types. The remaining three specimens include two non-diagnostic mid-sections and a serrated point tip. Four of the five typable points can be classified into the Desert Side Notch (DSN) series. Two of the four DSN's are nearly complete, allowing us to measure them. Both are small, finely-flaked points with a deep basal-notch. One measures 15 x 7 x 2mm, and the second 12 x 10 x 3mm. A third specimen is missing a portion of the tip as well as both barbs. It is similar to the two complete points, however although a bit longer (this point was probably 24mm long), it also exhibits a deep basal-notch. A fourth DSN series point was recognized in the collection and consists only of a single barb, broken at the narrow gap between the side notch and basal notch where these points break most often.

A nearly complete point was classified as representing a second type. It is small and triangular with a straight-sided, straight-based stem. The overall length is 17mm, is 12mm wide and 3mm thick. The stem is 5mm long and 5mm wide. It is recognized as part of the Rose Spring series projectile points, which along with DSN's, are the common point types found in late-period prehistoric sites in the southern Sierra Nevada and surrounding localities.

The remaining three point fragments are not sufficiently complete to classify. These include two mid-sections and one tip.

Obsidian Biface Fragments (3)

Three incomplete obsidian bifaces were identified in the collections. The largest specimen is the basal portion of a large biface. It is neither stemmed nor notched but exhibits a convex, rounded base. Presumably, this tool may have functioned as a knife and was either hand-held or possibly hafted into a wooden handle. Its projected length is 63mm, is 21mm wide and 6mm thick. A tip and a mid-section of two additional bifaces were identified but were not sufficiently complete to measure.

Hammerstone (1)

A fragment of a large basalt stream cobble was identified as a hammerstone. The pointed end of this cobble as well as all three edges descending from it exhibit battering. This was probably used for direct percussion flaking of basalt cobbles. This tool is also a core. It has been broken by percussion flaking with several percussion flake scars present. It weighs 0.5 kilograms, is 98mm long, 76mm wide, and 48mm thick.

Basalt Core Tools (2)

Two large fragments of basalt cobbles were identified as tools by the presence of numerous, carefully-struck percussion flake scars surrounding their perimeters. One exceedingly large specimen measures 118 x 79 x 28mm and exhibits cortex over much of its surface. The longest edge appears to have been modified by the removal of large percussion flakes resulting in an edge suitable for some type of cutting, scraping, or chopping function. Refraining from the use of such terms, we will simply call this specimen and the one described below as core tools, although a dulled edge does suggest heavy chopping.

The smaller example is also of a greenish-colored, fine-grained basalt but lacks cortex on any surface. It measures 54 x 62 x 20mm. The flat, angular chunk of basalt has been deliberately trimmed with a good number of percussion flakes which has resulted in a sharp edge around its entire perimeter. This edge has not been noticibly altered through use.

Obsidan Micro-Drill (1)

An obsidian drill fragment missing only a part of the tip was found in unit B13 in the disturbed midden. The most remarkable feature of this finely-flaked tool is its incredibly small size. The fragment is 7mm long, 4mm wide, and 2mm thick. The projected length of the complete tool is 9 or 10mm. This drill may have been employed for the manufacture of stone, bone or shall beads, although no beads were found in this sample. It could also have been used as a perforator.

Obsidian Flakes (90)

Ninety obsidian waste flakes were recovered, which is a fair number given the relatively small size of the sample. All are extremely small and none have any cortex which indicates that core reduction or biface manufacture did not occur at the site. These flakes are probably a result of tool sharpening. Only three flakes are over 15mm size, 13 are between 5mm and 15mm in size, and 74 are smaller than 5mm. All three of the largest flakes exhibit a re-touched edge of fine nibbling indicating that these are flake tools. Only a few of the others show edge wear or modification.

Large Flake Tools (2)

Two large percussion flakes, one of basalt and one of quartz, appear to have been used as tools. Fine retouching by pressure flaking is noticed on an naturally-occurring beveled edge resulting in an excellent scraping or cutting tool edge. It measures 55mm x 30mm x 13mm. The retouched edge is 16mm long. The basalt example is similar but slightly larger. The retouched edge is 52mm long.

Large Basalt Core-Reduction Flakes (11)

Several large, angular chunks and flakes of basalt, many with cortex, were recovered. These range in size from 63 x 45 x 14mm to 22mm x 16mm x 5mm. They have been derived from direct free-hand percussion flaking of basalt cobbles and indicates that primary core-reduction of locally-obtained basalt stream cobbles occurred at the site. The total weight of the eleven artifacts is 0.6 kilograms. Some of these may have been used as tools, although no deliberate modifications to any edges resulting from re-working or through use could be detected.

Small Basalt Interior Flakes (28)

Numerous interior waste flakes of basalt are present but unlike obsidian flakes, not all are small but exhibit much more variation in size. Eleven of these are over 15mm long, the largest of which is 45mm x 38mm x 11mm. Fifteen basalt flakes are between 15mm and 5mm in size, while only 2 are smaller than 5mm. Corex is absent on all flakes. None exhibit any obvious

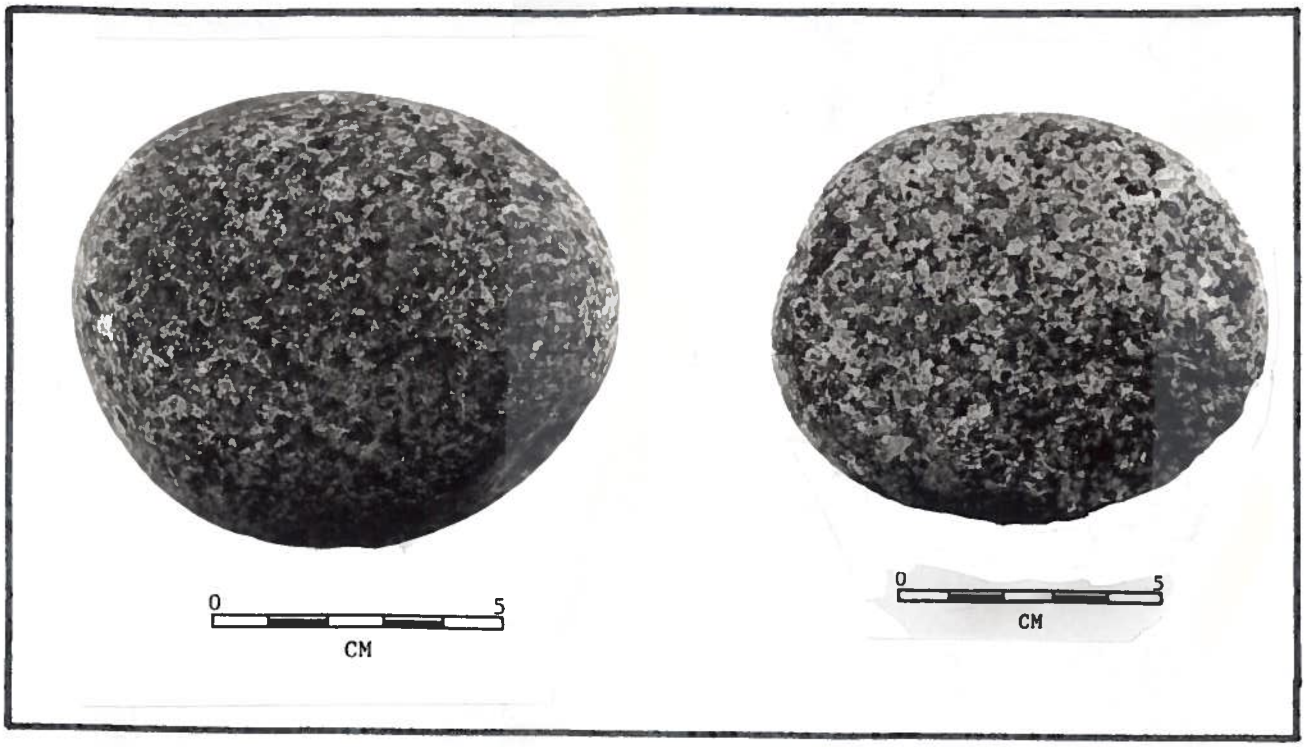


Photo of two granite manos

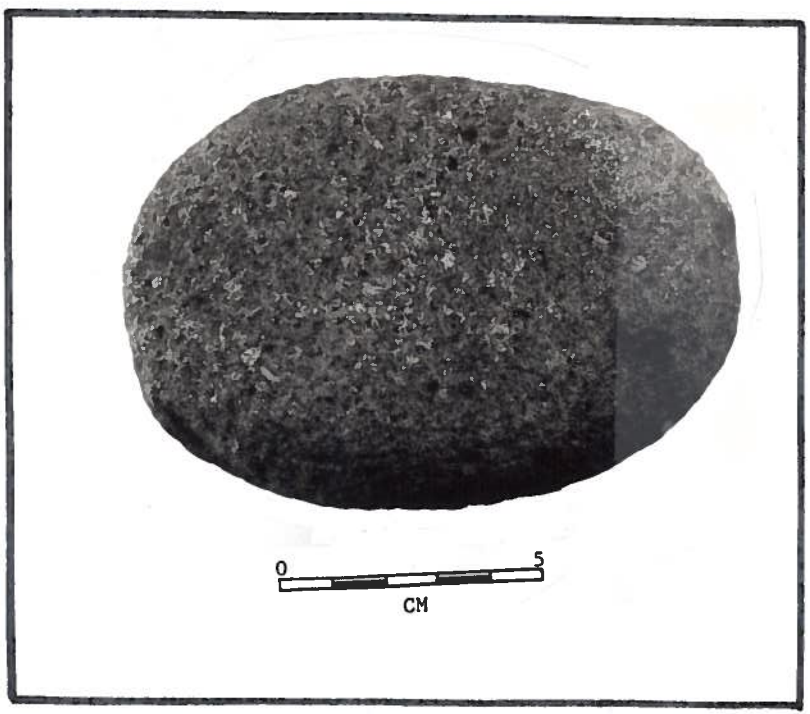
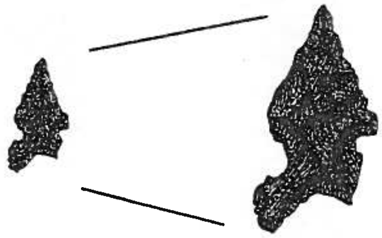


FIGURE 8

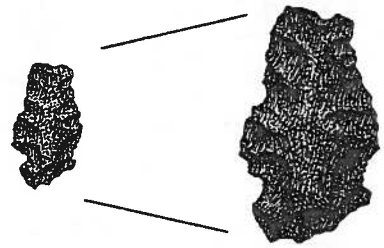
Photo of andesite mano

two views of the granite pestle found
on the surface

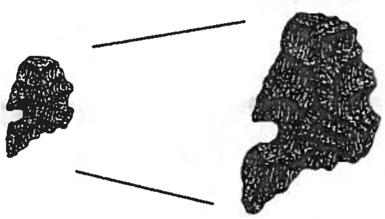
FIGURE 9



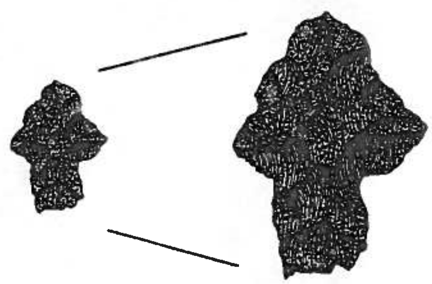
A



B



C

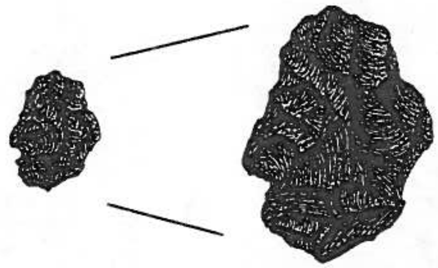


D

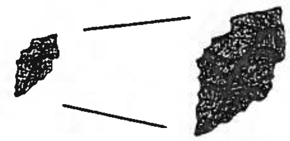
drawn actual size on the left
enlarged two times on the right

OBSIDIAN PROJECTILE POINTS

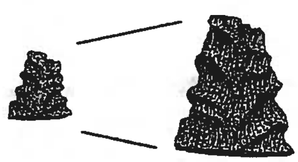
FIGURE 10



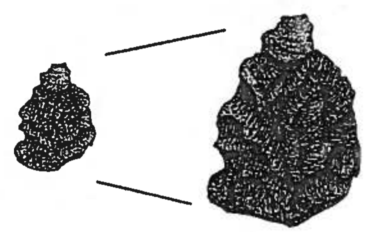
A



B



C



D

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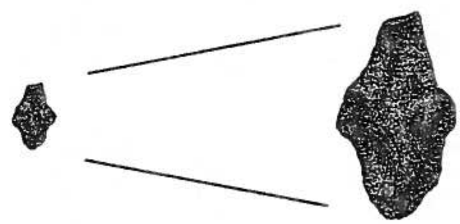
OBSIDIAN PROJECTILE POINTS

FIGURE 11



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OBSIDIAN MICRODRILL

FIGURE 12

A

B

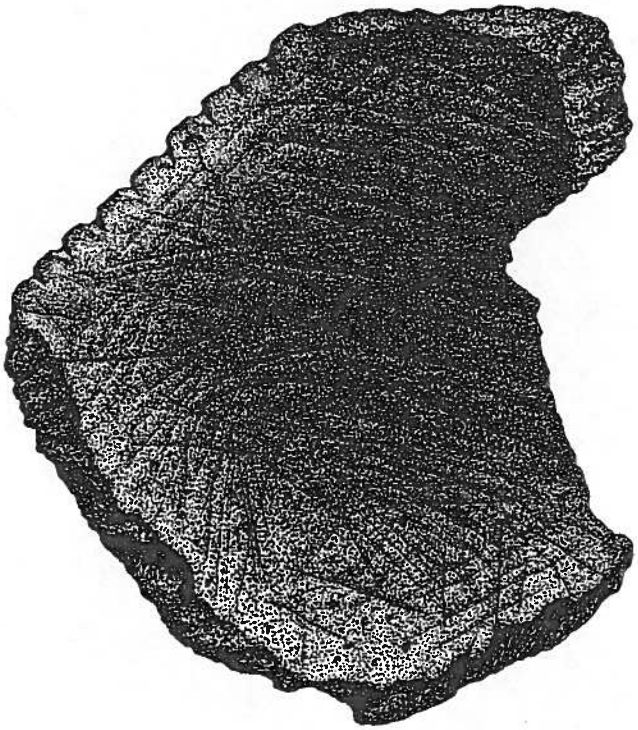
C

D

drawn actual size

A–C obsidian biface fragments
D   obsidian utilized flake with retouched edge

FIGURE 13



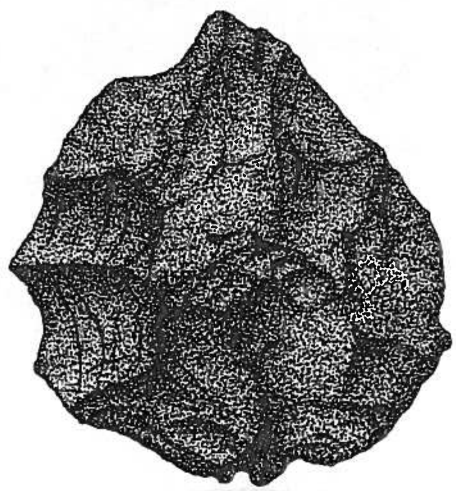
A

B

drawn actual size

SOAPSTONE BOWL FRAGMENTS

FIGURE 14



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BASALT FLAKE TOOL

FIGURE 16

signs of retouch or edge utilization and these are identified as pieces of debitage from basalt core reduction and secondary sequences.

Quartz Flakes (6)

Unlike basalt and obsidian, quartz is not common in the assemblage. Six small interior flakes of quartz range in size from a large of 19 x 15 x 4mm to a small of 5 x 5 x2mm. Cortex is absent as is any evidence of edge utiliztion. They appear to be waste flakes from the reduction of a quartz core.

Metavolcanic Flake (1)

A single waste flake of a green, chert-like rock identified as metavolcanic stone was found at the site. It measures 30 x 17 x 8mm and exhibits a striking platform, a possitive bulb of percussion, and an impact point. One edge may have been utilized.

Jaspar Flake (1)

A single interior waste flake of jaspar measuring 7 x 5 x 2mm was found in the disturbed midden at unit 13D. This is the only piece of jaspar found in our sample.

Bone Fragments (10)

Very little bone turned up in the excavations possibly due to poor preservation. Sierran soils are highly acidic which rapidly erodes bone remains. All 10 of the fragments are small, so small in fact that it was impossible to identify which animals are present, other than to say that large mammals (such as deer) are probably represented. All 10 are heavily calcined and have a white or mottled blue appearance. This sample of bone probably consists of food remains.

Bullet Casing (1)

A single .22 caliber bullet casing was recovered in the disturbed overburden at unit 13D. It measures 15mm in length with a diameter of 6mm. It was rim-fired and embossed with "Super X". This is not considered to be evidence of historic contact or of an historic component. This is a modern bullet casing.

Discussion of Important Time Markers

by Eric Kauffman

Excavations recovered three general classes of artifacts that have temporal significance: flaked stone tools, brownware pottery, and steatite sherds. These artifacts indicate a late prehistoric occupation beginning after A. D. 1300 and prior to historic period, with the earliest possible use of the site occuring at around AD 600.

Several investigators working in the Great Basin region, suggest a time span for Desert Side Notched Series Points from around AD 1300 to AD 1870 (McGuire and Garfinkel 1980:31; Baumhoff and Bryn 1959; Hester and Heizer 1973; Bettinger and Taylor 1974). In the southern Sierra, Moratto (1980:53) reports C-14 dates that range AD 1350 to AD 1450. The southern Sierra C-14 dates concur with dates from the Great Basin. From the evidence presented it appears that this type of point in the southern Sierra has a temporal span from AD 1300 until historic times.

McGuire and Garfinkel (1980: 31 and 40) suggest that in the southern Sierra, Rose Spring Contracting Stem Series points occur between AD 600 and AD 1300. But according to Moratto (1980:53) there are southern C-14 dates that range later, from about AD 1140 to AD 1445. These later dates are supported by Blount et al. (1984) who reports C-14 dates ranging from AD 1445 +/-95 (CA-MAD-106) to post AD 1765 (CA-MAD-153). It appears that these dates place the temporal range of Rose Spring points from the 7th through the 18th century in the southern Sierra Nevada.

At FRE-1044, a C-14 date of circa AD 1000 was obtained in direct association to brownware pottery (Theodoratus et al. 1984:523). Other researchers suggest that widespread use of brownware in the Sierra Nevada occurred at around 1300 AD (Wallace, Wallace, and Meeker 1989). Taking the C-14 dates into consideration it seems that brownware spans from AD 1000 to historic times. Blount et al. (1984:522) provide a C-14 date for a steatite bowl fragment at about AD 260 (MAD-159). Steatite bowls were also used much later, right up to historic contact.

Discussion

The presence of DSN series points suggests a late occupation that begins possibly as early as AD 1300. However, an earlier occupation could also be possible since Rose Spring series points enter wide spread use slightly earlier--perhaps around AD 600 (McGuire and Garfinkel 1980:31,40). In addition, Owens Valley Brownware pottery is known to date after AD 1000, the steatite sherds have been associated with dates as early as AD 260. Artifacts in all these materials were found on or near the disturbed surface of the site. These surface finds cannot be stratigraphically analyzed because of prior disturbance. Without the benefit of C-14 dates (which was not possible due to insufficient recovery of organic materials), and with the hydration data set aside, it appears from the artifact types that occupation at TUL-472 was toward the latter part of the prehistoric period, perhaps around the same age as the Chimney Phase (AD 1300 - Historic), as described by McGuire and Garfinkel (1980:53).

Obsidian Analysis and Interpretation

Five obsidian artifacts from TUL-472 were subjected to sourcing and hydration analysis by Richard Hughes and Thomas Origer (see appendix 4 and 5). Three specimens are Desert Side Notched series projectile points, one is a Rose Spring point, and the last artifact is the basal portion of a large biface which probably was a knife. The following is a summary of sourcing and hydration reading:

Catalogue #	Description	Mean hydration reading in microns	Approximate age years before present	Source
100-5	DSN point	2.6	600	West Sugarloaf, Coso Volcanic Field
100-53	DSN point	2.4	500	"
100-36	DSN	1.3	200	"
100-6	Rose Spring point	1.5	230	"
100-23	biface	1.2	170	"

The obsidian which was flaked to form these five artifacts was obtained from the West Sugarloaf locality of the Coso Volcanic Field. The Coso obsidian source is an enormous field of high-quality obsidian. It is located east of the Sierra Nevada, approximately 80 miles southeast of the Salt Creek Ridge site.

Four distinctive subgroups have been identified within the Coso Field and Hughes (1988a) suggests that there may be some degree of hydration variability between these subtypes. Mark Basgall (personal communication) has conducted extensive analysis of Coso obsidian. He concluded that there is only a minor fluctuation in hydration values between the four Coso subtypes and it is not a significant variable for converting the hydration reading to a actual date. Temperature, however, is an extremely important variable. The cooler the climate, the more slowly Coso obsidian hydrates. Therefore, although a DSN point from Owens Valley (a hotter climate than Case Mountain) with a 2.6 micron reading is only 300 years old, it is Mark Basgall's opinion that our DSN point with a 2.6 micron reading recovered from a site at 6250 feet in elevation is probably 600 years old.

Another DSN point has only a 1.3 micron value which is interpreted to be approximately 200 years old. These dates, of course, are not surprising. The presence of Owens Valley brownware sherds, and Rose Spring and Desert Side Notched series projectile points are reliable indicators of a late-prehistoric occupation. The obsidian data do indicate however that some time depth is present; from circa AD 1300 to AD 1820.

We do not believe that the significant variation in hydration values for the 3 DSN points is a sampling error or a result of differential preservation or hydration variables. We believe that a difference in age is the most likely explanation. Unfortunately, this cannot be demonstrated stratigraphically.

There was absolutely no correlation between hydration values and provenience (depth). This can easily be explained, however, by the fact that our study site had be bulldozed to oblivion prior to the excavation, and as we suspected, there is little or no stratigraphic integrity in the units we dug.

Careful examination of the three DSN points indicated that there is a considerable degree of stylistic variation which may be explained by different ages. The oldest specimen (#100-5) is relatively short, wide, and thick compared to the others. It is remarkably similar to the unusual Panoche variant found in DSN points from western Merced County in overall configuration. The Case Mountain DSN is much smaller. The later DSN's from this site are incredibly small, but much longer relative to the width. They appear more finely flaked and are thinner and lighter.

Conclusion and Interpretations of this Study

The data recovered from CA-TUL-472 do not allow us to formulate a complete reconstruction of the prehistoric occupation which occurred there. Certain conclusions or inferences can, however, be put forth.

The Salt Creek Ridge site was probably seasonally occupied during the summer and fall months of the year. It was likely visited by small family groups of either the Patwisha Monache or Wikchamni Foothill Yokuts. Evidence tends to favor the Patwisha since their winter settlements were immediately north of this site at the base of Salt Creek Ridge. The strong ties to groups east of the Sierra also would tend to explain why all five sourced obsidian samples came from the Coso Volcanic Field, an area to which presumably, the Monache had easier access than did the Yokuts. The Salt Creek Ridge site could easily have been visited by the Wichamni band of Foothill Yokuts, as their principal territory was only seven miles west as the crow flies. A Yokuts occupation at TUL-472 is strongly suggested by Kroeber. He stated that the Wikchomni Yokuts "frequented the adjacent hills in the summer" (Kroeber 1925:479). The "adjacent hills" is probably Case Mountain and Salt Creek Ridge. Both groups may have visited TUL-472. Relationships between the Yokuts and Monache were such that they were welcome to move into each others territory from time to time, although some conflicts did occur. The fact is, however, that both cultures are quite similar archeologically, and the question regarding the ethnographic affiliation may never be adequately resolved.

Whether they were Patwisha bands, Wikchamni bands, or both, it seems reasonable to assume that they were attracted to the campsite on Salt Creek Ridge for a number of reasons. At 6250 feet, it was probably a welcome escape from the hot San Joaquin Valley summers, and a place to exploit the abundant plant and animal resources available. The campsite on Salt Creek Ridge contains granite boulders with flat surfaces suitable for bedrock mortars, has a reliable spring nearby providing an adequate source of water, and contains five rock basins which the Indians sought-out for some use.

Based on the mortar typology derived from Monache informants, it seems that TUL-472 may have been a specialized camp for the initial processing of acorns (starter mortars) and the processing of seeds and berries. Acorns of black oak trees and pine nuts from sugar pines (both quite abundant in this area) were probably heavily exploited. The grinding slick, according to Monache informants, were used to process berries such as manzanita, elderberry, or wild cherry.

The recovery of eight projectile point fragments in our relatively small sample excavated suggests that the occupants practiced a good deal of hunting with stone-tipped arrows. The recovery of bone was low due to poor preservation and the tiny fragments could not be identified. The pieces do look burned suggesting that these are food remains. It seems quite likely that they were hunting deer, rabbits, squirrels, quail, and perhaps bears.

Unfortunately, our study did not produce any new information concerning the use of the rock basins other than reinforcing a pattern documented by the Mountain Home project (Wallace, Wallace and Meeker 1989). The basins were undoubtedly used for some purpose, even if they are of natural origin. They could easily have been used for leaching acorns, as a pit to burn pitch from sugar pine cones, ovens for cooking bulbs, or as storage receptacles for acorns or pine nuts.

The occupants made vessels of both pottery and soapstone, presumably used for cooking and storage of food and water. A characteristic of these occupants was to carve decorative incisions across the rim of their soapstone bowls. This may later prove to be an important cultural marker.

The micro-drill suggests that the manufacture of beads took place here. While none were found in our sample, soil conditions probably do not favor preservation of organic items. Indeed this drill could have been used for drilling wood, perforating leather garments, or a number of functions, but these types of drills are found in great abundance at lower elevation late-prehistoric site which also contain vast quantities of shell beads. The manufacture of such ornaments seems likely to have occurred at this site also.

Previous archeological research from the excavation of nearby sites have suggested a late occupation of the Kaweah River area to begin circa AD 1300. This final prehistoric period is thought to be represented by such artifacts as <u>Owens Valley Brownware</u> and small, obsidian projectile points. Since there is a lack of radiocarbon and obsidian hydration dating from this area, the hydration readings from the Salt Creek Ridge site are important. The rim measurements based on known rates of growth are estimated to represent an occupation of this site lasting four centuries from AD 1300 to AD 1700. In terms of regional chronologies, the site appears to be contemporary with the Chimney Phase of the Pacific Crest Trail of the Southern Sierra Nevada, and the Madera and late Raymond Phases of Buchannan Reservoir. It also appears to be identical with the late-prehistoric archeological complex identified at Mountain Home Demonstration State Forest.

Management Considerations

In spite of the tremendous disturbance caused by fire-fighting activities in 1987, the Salt Creek Ridge site still has good potential for subsequent archeological research. It is a significant resource which should be wisely managed. The following recommendations are offered to minimize or avoid additional damage to the cultural deposit during subsequent years:

1. Road maintenance operations should include protection measures for this site. We suggest keeping the present alignment without any widening of the road. The road may need periodic grading. If possible, pick up the blade and avoid grading the road where it crosses the site. Since the site area is relatively small, this should present no particular difficulty. If low spots need to be improved, we suggest spreading clean fill rather than continued grading. Well-placed water bars north and south of the site will minimize erosional run-off and should allow continued use of a serviceable road for many years without significant modification. Avoid using this ridgetop road during wet conditions. This will lessen the need for continued maintenance.

2. There is little or no merchantable timber growing within the site boundaries. The surrounding area could be logged, however, without causing any disturbance to the site. If a THP is submitted, we suggest the site be identified as a special treatment area to be completely avoided. We do not recommend using the saddle area (north of site) as a log landing since this will concentrate activities adjacent to the site. We suggest finding an alternative log landing area and use care during road improvements, as stated above.

3. Since the site is situated in a relatively remote location with difficult access, it is not likely to receive impacts from relic hunters ("pot hunters"). However, they would love to find this site if they could. The best way to manage this type of site is to keep its location confidential, keep access roads gated and locked, and monitor it from time to time. Contact CDF if any evidence of vandalism is noted.

Finally, we wish to emphasis that our study was extremely limited in scope. Much could be learned if this site were subjected to a comprehensive, intensive archeological investigation. I hope the new landowner helps to protect this important site and would allow for additional archeological research in the event that a subsequent study could be arranged and adequately funded.

Acknowledgments

Like most archeological investigations, this study benefited by helpful contributions from many people. BLM archeologist Duane Christian alerted CDF to the presence of this significant site and made efforts to protect it from damage during fire suppression activities. He also provided valuable information concerning the archeology of this region. Bob Gerry provided a copy of his 1977 survey report and original site record. The artifact illustrations were prepared by John Betts. John has become one of the finest archeological illustrators in California and his contribution to this report, done gratis and on a moments notice, is truely appreciated. Thomas Origer and Richard Hughes conducted obsidian sourcing and hydration analysis. Mark Basgall provided helpful information concerning Coso obsidian. We also wish to thank Robert Krohn, timber manager of Sequoia Forest Industries for protecting this site during timber harvesting operations and for granting us permission to excavate. William J. Wallace reviewed the manuscript and made many improvements and corrections to it. Finally, we wish acknowledge the effort made by CDF Forester Lindell Yoshimura who directed a rehabilitation crew and requested this study. He conducted a clean-up operation prior to our arrival by removing logs and brush without causing further disturbance to the cultural deposit. The participation of archeologists in the Case Fire of 1987 was directly due to Mr. Yoshimura and without his persuasive arguments this study would never have been conducted.

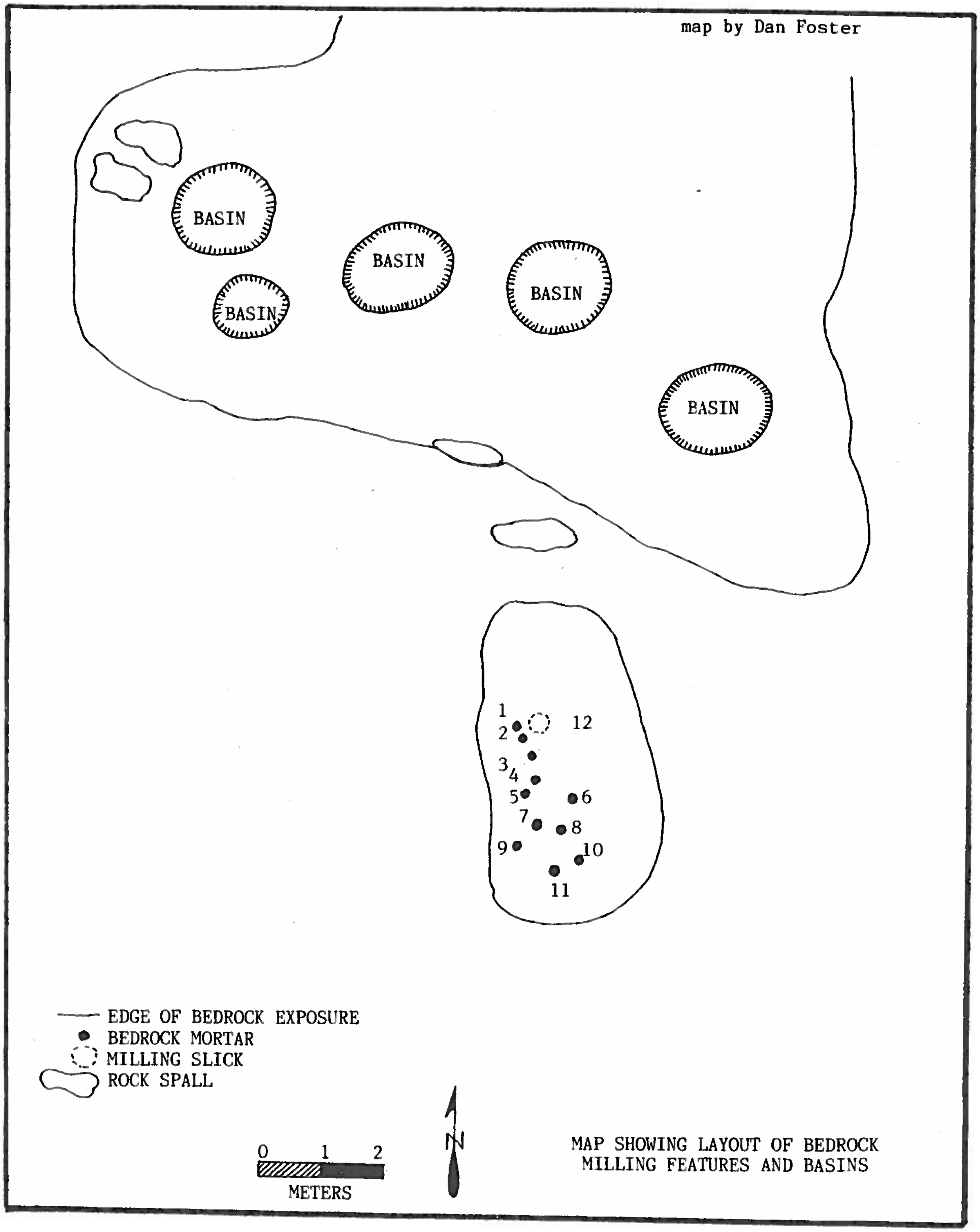
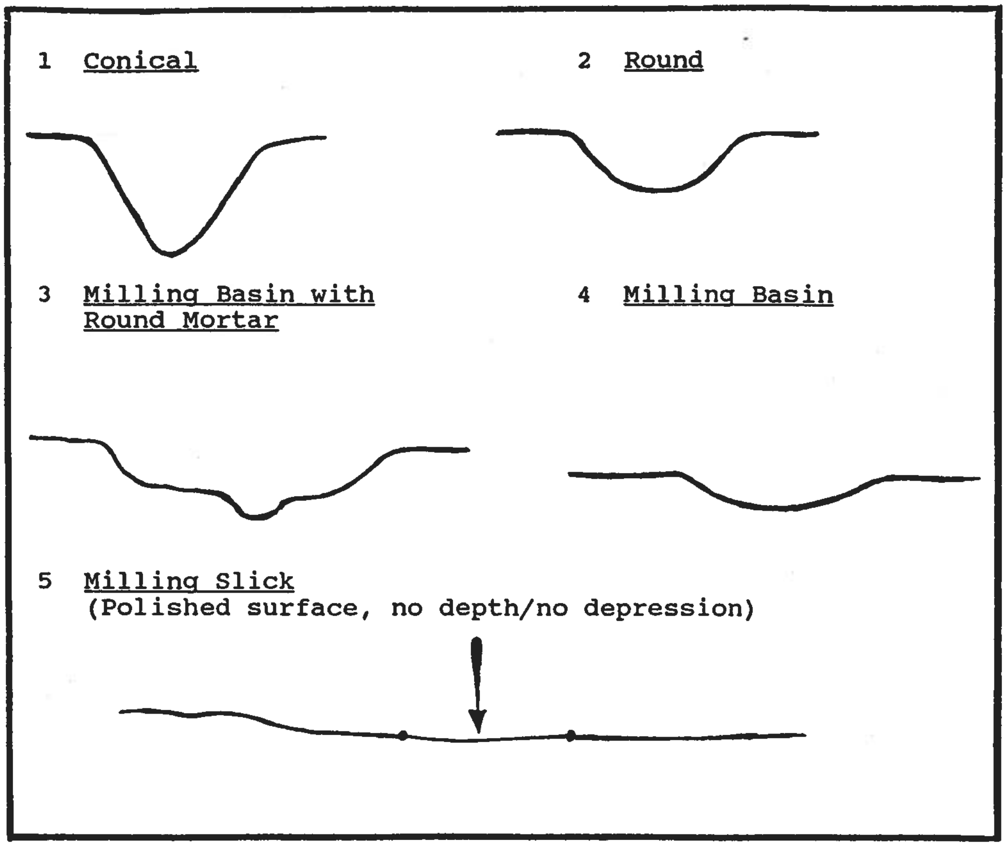

map by Dan Foster
BASIN
BASIN
BASIN
BASIN
BASIN
BASIN
1
2
12
3
4
5
6
7
8
9
10
11
EDGE OF BEDROCK EXPOSURE
BEDROCK MORTAR
MILLING SLICK
ROCK SPALL
0
1
2
METERS
N
MAP SHOWING LAYOUT OF BEDROCK
MILLING FEATURES AND BASINS

FIGURE 17

MILLING FEATURE #	LENGTH	WIDTH	DEPTH (cm)	REMARKS
1	22	15	4	mortar with oval basin(mortar11cm)
2	20	13	4	mortar with oval basin(mortar8.5cm)
3	19	19	12	conical mortar
4	22	13	4	mortar with oval basin(mortar8cm)
5	16	16	10	conical mortar
6	14	14	4.5	round bottomed mortar
7	20	13	3.5	oval milling basin
8	10	10	2.5	round bottomed mortar
9	17	17	8	conical mortar
10	10	10	3.5	round bottomed mortar
11	14	13	3.5	round bottomed mortar
12	20	40	0	milling slick

TABLE LISTING MEASUREMENTS OF THE MILLING FEATURES

FIGURE 18



DRAWING SHOWING THE SHAPE OF THE FIVE DISTINCT MILLING FEATURE TYPES PRESENT AT CA-TUL-472

FIGURE 19

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Appendix 1

Previous Archeological Research

By
Eric Kauffman

Previous Archeological Research

General descriptions of southern Sierra Nevada archeology are provided by Moratto (1984), Blount et. al. (1984), and Fee (1980). In addition to these works there are two groups of archeological investigations that are significant to the present study. The first group of projects were conducted at Case Mountain, the Kaweah River Drainage, and at Mountain Home State Forest. The second group of investigations were broader in scope; they interpreted the regional chronology of the southern Sierra Nevada. Each group of archeological investigations are individually discussed below.

Peak Survey, Kaweah River, and Mountain Home Demonstration State Forest

Peak Survey

TUL-472 was initially reported during a survey by Peak and Associates in 1977. Their goal was to locate any archeological sites and to determine the archeological potential of the Case Mountain vicinity. At the time CA-TUL-472 was described as having five bedrock basins without other cultural remains. The survey party apparently missed the mortars, habitation debris, and portable artifacts that were present at TUL-472. (The removal of the forest duff by tractors undoubtedly made viewing of the site much easier). One other site was found during the Peak survey--CA-TUL-471. It was recorded as having 22 bedrock basins and 12 bedrock mortars, with no associated midden or artifacts. In all, the Peak survey covered approximately 800 acres by spot checks on foot and driving along dirt roads. They determined that the steep terrain and lack of water rendered the area unsuitable for settlement. In summary, the survey report concluded, "it is unlikely that undisturbed cultural resources exist on the property" other than TUL-471 and TUL-472 (01977:4), but amazingly, they failed to recognize the substantial cultural deposit at TUL-472.

Kaweah River Drainage

Within a few miles of TUL-472 in the Kaweah River drainage, the results of several projects have led to a general outline of the region's prehistory. One site near Lake Kaweah, TUL-10, (Slick Rock Village) contained a late period assemblage of glass beads, small obsidian points, bone awls, clay pipes, steatite disk beads and vessels, choppers, scraper planes, and over 1000 sherds of Tulare Plain Ware, (Fenenga 1952, Moratto 1984:330). Testing of another site near the same location [TUL-145, Cobble Lodge] by Berryman and Elsasser (1966), uncovered two periods of occupation. The earliest was indicated by cobble mortars and large points, and the latest typified by pottery, smaller points, and steatite beads. In 1960 Von Werlhof excavated TUL-24, a Potwishia village site with pictographs and a midden deposit. That site had three possible occupations beginning about A.D. 1300-1400 (Wickstrom 1988:10; Moratto 1984: 329, Von Werlhof 1960, 1961). From the work at the Potwishia village, Von Werlhof suggested that obsidian and brownware pottery were introduced into the area at around A.D.1300-1400. However, as Wickstrom (1988:10) notes, this is unsupported by radiocarbon or obsidian hydration dating. In addition to the work at Slick Rock and the other two locations, hundreds of sites have been located along the Kaweah River, many of them are large habitation sites with deep middens situated on benches or flat terraces. In some locations there are over 20 sites per square mile along the river. Clearly, this area was densely populated during prehistoric times.

Mountain Home Demonstration State Forest
To the south of the project area, in the Mountain Home Demonstration State Forest (owned and managed by CDF), a recent survey by Wallace, Wallace, and Meeker (1989) documented a seasonal occupation within the higher transition zone. They relocated and studied twenty-two sites on the forest which they classified under three different categories: (1) major seasonal base camps, (2) temporary camps, and (3) milling places (Wallace et al. 1989:7-8). Their field work recovered a wide array of point styles including Cottonwood, Desert Side-notched, Rose Spring, Pinto, Elko-eared, Elko Corner-notched, Humboldt Concave Base, and Sierra Concave Base points. Wallace et al. (1984) also found two steatite bowl sherds and numerous Owens Valley Brownware sherds.

<u>Early Occupation at Mountain Home</u>: The work at Mountain Home revealed two periods of prehistoric occupation. The earliest culture is represented at Vincent Spring, Locus A, and possibly at Pack Station [TUL-1065]. This early occupation of the forest is signified by the presence of Pinto, Elko, and Sierra Concave-Base points. The age of Pinto point types according to Wallace et al. (1989: 23) and Moratto (1984:333), ranges from around 4000 B.C. to 1200 B.C., and Elko, Humboldt, and Sierra Concave point styles range from 1200 B.C. to A.D. 600. The Wallace report suggested that the early visitors to the forest were small hunting groups that shifted from one spot to another. The game they hunted might have been deer, bear, or other large mammals. Because of the cold winters at Mountain Home, the researchers surmised that the hunting parties were foothill or valley people who moved into the mountains during the summer months.

<u>Late Occupation at Mountain Home</u>: The late-prehistoric component at Mountain Home had a different subsistence pattern based on plant collecting and processing. A wide variety of materials and artifacts characterize the later sites. Artifacts and materials include small arrow points, cultural midden, flaked obsidian waste, milling equipment and features, pottery,

and steatite artifacts (Ibid: 39-41). Glass beads and knapped bottle glass appear in protohistoric-historic era assemblages. The greater intensity of late occupation on the forest implies that in the final prehistoric period larger groups visited the forest, perhaps staying longer at certain locations while satellite groups spread out to gather plant resources fish, and hunt game.

Second Group: Chronologies of the Southern Sierra

At this point, my discussion focuses on the better developed chronological sequences for the southern Sierra. The principal sources that are used here are: Garfinkel et al. (1980), McGuire (1981), McGuire and Garfinkel (1980), Moratto (1984), Moratto and Riley (1980), and O'Brien (1981).

Buchannan Reservoir Chronology

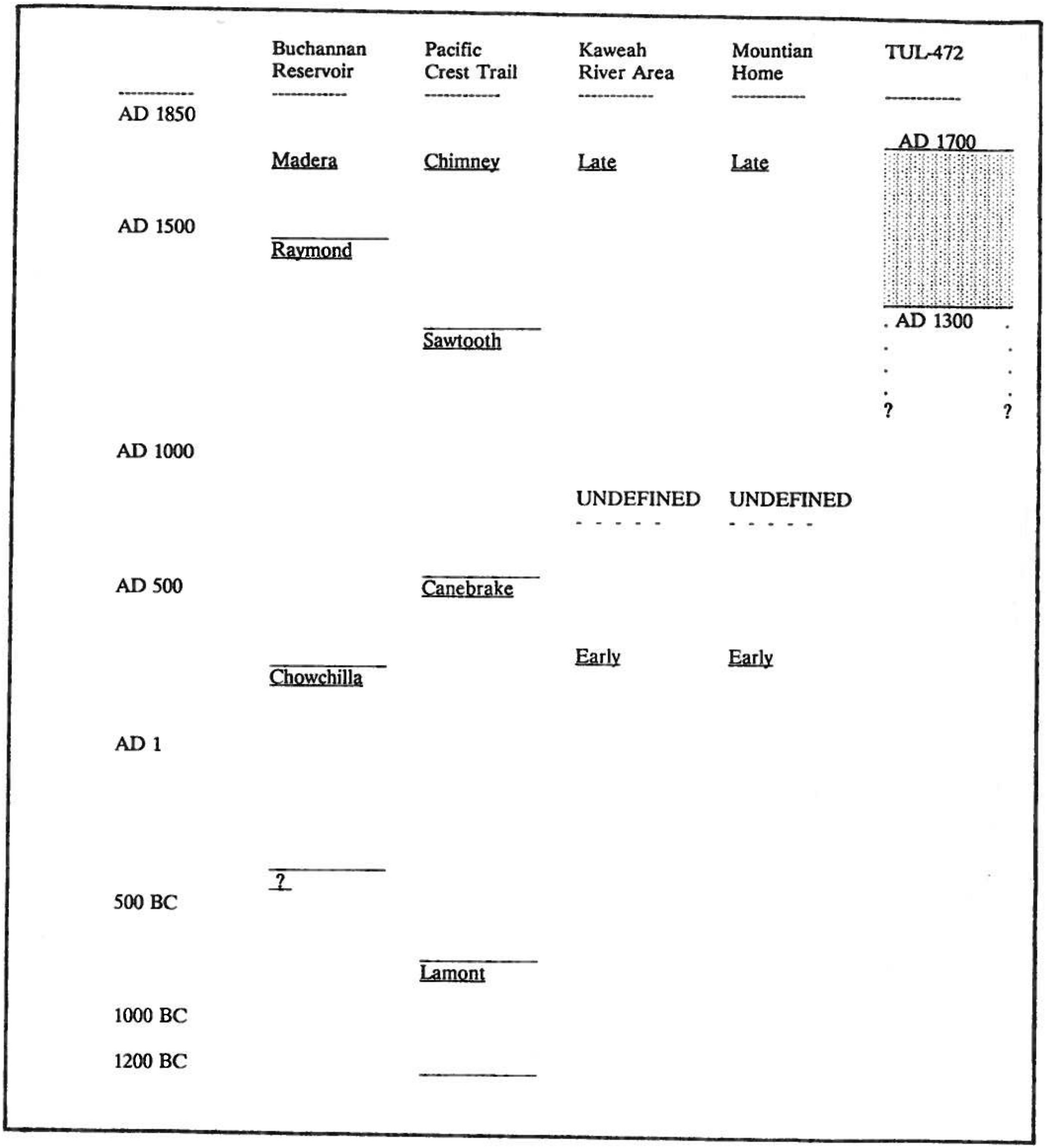
Approximately 28 miles east of Merced, where Buchannon Reservoir is now located, the excavations of over two dozen sites over the course of 15 years has led to the development of a chronology of the south-central Sierra Nevada. This chronology, as it is presently understood, can be divided into three phases: Chowchilla, Raymond, and Madera. The Chowchilla Phase (300 B.C. - A.D. 300) is characterized by a scattering of large villages along the Chowchilla River (see Moratto 1984:316-8). Heavy reliance was placed on hunting, fishing, hard seeds, and possibly some acorns. Large projectile points, cobble mortars, bone fish spears, and *Olivella* and *Haliotis* shell ornaments are typical markers of this phase. Additional characteristics of this time period include evidence of trade relationships with cultures of the Great Basin and the desert southwest, and some artifactual relationships with the Windmiller assemblages of the Central Valley.

According to Moratto (1984:319-320) the next phase, Raymond (A.D. 300-1500), "reflects an episode of cultural instability and change " (Moratto 1984:319). He went on to explain:

> Populations were small and dispersed; old villages appear to have experienced chronic cycles of occupation and abandonment after circa A.D. 500. Violence was common. By contrast to Chowchilla [burial practices that involved] displays of ...wealth, Raymond burials seldom were furnished with anything but cairns of boulders and millingstones (Ibid 319-20. Brackets added).

Trade relations seem to have changed between the Chowchilla and Raymond Phases. One indication of this change is evident by the absence of shell ornaments from the coast, which were common in Chowchilla times, suggesting that coastal resources were cut off to the interior.

The subsistence of the Raymond Phase culture was largely based on acorns and hard seeds. Hunting was less important, and evidence of fishing was absent. Artifacts included Rose Spring



BAR GRAPH SHOWING THE
TEMPORAL CHRONOLOGIES FOR
THE SOUTHERN SIERRA NEVADA
by Eric Kauffman

FIGURE 20

or Eastgate series points, bedrock mortars, cobble pestles, and other milling stones.

A.D. 1500 until 1850 was the time of the Madera Phase (Moratto 1984:316-7, 320-1), which "represents the spread and cultural florescence of ancestral Southern Sierra Miwok." Core villages along the main waterways emerged during this time with smaller satellite settlements being located in the back-country. Population growth increased, and social status was increasingly shown in the grave goods of this time. The bow and arrow was in use evidenced by Desert Side Notched and other small point types. Steatite beads and pendants, Olivella ornaments, bone tube beads, and plain brown pottery are typical artifacts from this period. These people depended heavily on acorns for food. They also are thought to have exploited other plants, hunted elk, deer, and smaller game.

Pacific Crest Trail Chronology

While the cultural phases from the Buchannan Reservoir have suggested a strong Central Valley influence, the chronology from the Pacific Crest Trial is influenced by Great Basin cultures. More specifically, the Pacific Crest chronology documents the aboriginal exploitation of the high-elevation pinon pine areas of the far southern Sierra, along the margin of Tulare and Kern counties. This area was inhabited by people who were the ancestral to the ethnographic Tubatulalabal.

According to Garfinkel et al (1980:71) the Pacific Crest cultural sequence consists of four phases: Lamont, Canebrake, Sawtooth, and Chimney Phases. The Lamont Phase (1200 B.C. - A.D. 600) is marked by Pinto series points. McGuire and Garfinkel (1980:52) suggest that, "during this ...period small hunting parties would make sporadic forays into upland areas [of the southern Sierra Nevada], ...in search of large game". McGuire and Garfinkel also suggest that small hunting parties probably emanated from base camps located along the major streams in Owens Valley and Indian Wells Valley (Ibid). Although these early groups were primarily hunters, these groups might have exploited pinon pine nuts to some degree.

The Canebrake Phase (1200 B.C. to A.D. 600) is a period when the Great Basin people were thought to more systematically exploit the high elevation pinon pine areas. The types of projectile points that typified this era were Sierra Concave Base points. To a lesser degree, Elko and Humboldt Concave points were also used, but are only occasionally found. The large point types of this period suggest that the atlatl was still being used. The milling equipment commonly used was the mano and metates.

The subsistence strategy of the Canebrake Phase was distinctively different than the Lamont Phase. During Cranebrake, the

> "settlement pattern ...is characterized by the initial appearance of pinon base camps and temporary pinon stations

at approximately 500 B.C. Primary subsistence pursuits during this time involve the systematic exploitation of pinon nuts, the hunting of large and small game, and ancillary seed and bulb collection" (Ibid).

In short, the Canebrake era was the first time that people thought to have originated from the Great Basin intensified their exploitation of the pinon pine nuts of the far reaches of the southern Sierra Nevada.

The Sawtooth Phase (A.D.600 - A.D. 1300) witnessed an escalation of the pattern started earlier--namely, the exploitation of the pinon pines. The base camps, temporary pinon stations, and temporary hunting camps that were common of the Canebrake Phase are also typical of Sawtooth Phase. While there are similarities between these two phases, there are important differences. For instance, McGuire and Garfinkel (1980:52-53) noted that the bow and arrow in the Sawtooth Phase replaced the widespread use of the atlatl of Cranebrake. Projectile points of the later phase were smaller as a result. The later point types included Rose Spring and Eastgate series. The food processing tool kit broadened during Sawtooth to consist not only of manos and metates but also included bedrock mortars and cobble pestles. Ornaments were present during Sawtooth including beads made of steatite, serpentine, talc, and Olivella shells.

The Chimney Phase (A.D. 1300 to historic), according to McGuire and Garfinkel (1980:53), continued the growing reliance on the pinon nut economy:

> "Subsistence-settlement structure remains essentially the earlier Canebrake and Sawtooth Phases. However, further increases in the number of sites securely dated to this phase as well as frequency of phase-marker artifacts suggest an even higher intensity of prehistoric occupation than before" (Ibid).

Artifacts that mark this phase include Desert Side Notched and Cottonwood series points, Owens Valley Brownware, and later during this phase--glass trade beads of historic origin.

The comparison of Buchannan and Pacific Crest chronologies given in Figure 20 indicate important differences exist between the two. The Buchannan chronology follows the development of an economy based on exploiting pinon pines at high elevations. The Pacific Crest chronology indicates that the pinon based economy began around 600 B.C., while at Buchannan Reservoir the acorn economy starts to take root after A.D. 300. This last point is perhaps the most meaningful because it suggests that the pinon-based economies have an earlier antiquity (by almost 1000 years) than the acorn-based economies of the southern Sierra Nevada. based on exploiting pinon pines at higher elevations. The Pacific Crest chronology indicates that the pinon based economy began around 600 B.C., while at Buchannan Reservoir the acorn

economy starts to take root after A.D. 300. This last point is perhaps the most meaningful because it suggests that the pinon-based economies have an earlier antiquity (by almost 1000 years) than the acorn-based economies of the southern Sierra Nevada.

In addition to the differences, there are important similarities which include: (1) a growing intensification through time of both types of economies; (2) a drop in the use of ornaments around A.D. 500 to 1400--a phenomena occurring with the appearance of Rosespring and Eastgate points; and (3) an increase in the use of ornaments, variety of artifact types, number and sizes of settlements at the time when DSN's appear.

Summary of Archeological Background

One intriguing point that is raised when comparing the two chronologies is that during the Raymond Phase, which lasted from A.D. 300 - A.D. 1500, the south-central Sierra people were apparently experiencing cultural instability and change. By contrast, at the same time the southeastern Sierra people were at a time of presumable cultural stability while they continued to intensify their pinon nut economy that was started centuries before. Thus, the central Sierra people may have been in a state of turmoil while the southern groups were not.

With this interesting note aside, here is a summary of the assumptions derived from the above review of past archeological research. The specific chronology of the Kaweah River locality is not entirely understood. A general chronology, however, does exist that includes an early period that is indicated by large points, cobble mortars, and choppers--and a later period signified by smaller points, pottery, steatite vessels, and bedrock milling equipment. From the work at Mountain Home, it is suggested that the early people had an economy and division of labor based on hunting and gathering of plant resources. These early groups moved into the high transition zone in small parties and stayed only for short periods in any one camp. The later groups, according to the Mountain Home researchers, had an economy based on the intensive exploitation of acorns. They probably traveled in larger groups, visiting the high transition zone during the summers, occupying camps repeatedly, gathering black oak acorns, and other fruits and nuts. They stayed at a location for a longer duration than the earlier people would have.

The two chronologies discussed above, Buchannan Reservoir and the Pacific Crest Trail, can be used to help develop the chronologies of the Kaweah locality.

Appendix 2

<u>Discussion of the Archeological Significance of Southern Sierra Rock Basins</u>

The so-called "Indian Bathtubs" (as they are known locally) are large round or oval-shaped depressions found in granite exposures in the upper elevations of the southern Sierra Nevada. The principal known locations of these basins are Giant Forest, Cresent Meadow, Redwood Meadow, Dorst Creek, Oriole Lake, Atwells Mill, Salt Creek, Case Mountain, Mountain Home, Balch Park, Jordan Peak, Tule River Indian Reservation, and Sequoia National Park. Resent surveys have shown that these features also occur at Tobias Meadow and in Scarlet and Davis Creeks. Many of these basins take the appearance of gigantic bedrock mortars with curious basin-shape profiles and rounded bottoms. The typical basin is three to four feet in diameter, up to two feet deep and quite symmetrical. Some are even larger and deeper. These rock basins have been a source of tremendous controversy for over one hundred years. The "mystery" has usually surrounded their creation--are they man made or natural?

Earliest accounts describing the features usually attributed their origin to an "ancient race" from the mountains. The following account is contained in an 1881 letter to historian H.H. Bancroft:

> ...there are numerous places in this county [Tulare] where some ancient people have scooped out holes in the rock, large enough, in some cases, to hold eight or ten barrels of water. They are found at a good camping place near the top of a mountain (Barton 1881 in Wallace, Wallace, and Meeker 1989:12).

George W. Stewart, a Tulare County newspaper editor, published the first major article on the peculiar rock basins in <u>American Anthropologist</u> in 1919 describing those from Sequoia National Park (Stewart 1929). In this detailed account, Stewart stated that the basins were "the work of a prehistoric race of men of whom the present Indians know nothing" and that "they are readily distinguished from both pot-holes and weather pits by the wonderful regularity and perfection of their shapes" (Stewart 1929: 419, 422).

Most researchers have dismissed the notion that the Indians somehow laboriously pounded out these huge depressions from solid bedrock, though the unlikely possibility of a human origin cannot be completely put to rest. This is largely due to the fact that various hypothesis describing natural creation have not been convincing. Two main natural origin theories have dominated the literature. One theory is that the basins originated from glaciers, in particular, from glacial "moulins" which cause plunge-pool erosion. Moulins are vertical tunnels in glaciers through which surface water falls. The water descends to various depths within the ice mass and potholes are sometimes formed when the bed of the glacier is reached. Few geologists still accept the moulin hypothesis, however, because vertically plunging water apparently does not rotate grinding stones as well as water entering obliquely (Balogh 1977:154). A more recent glacial origin hypothesis is that the erosion of a pothole is caused by "sub-glacial" flow which means water flowing between the glacier and the bedrock upon which it rests. Eric Barnes is convinced that the distinctive rock basins of the southern Sierra Nevada are "subglacial potholes" similar to examples found in Europe and further north in the Sierra Nevada (Barnes 1984). The problem with this view is that it does not explain the unique values present in the southern Sierra group. The potholes discussed by Barnes from Lucerne, France, Tuolumne Meadows, and the Mokeolumne River Canyon are similar to the southern Sierra group only superficially. They lack the unusual clustering, standard shape, symmetry, and site location pattern of those discussed here and in our opinion, it is a mistake not to recognize the distinctive features of the southern Sierra group of rock basins.

The other main hypothesis in the literature is that the rock basins were formed as solution pits from natural chemical weathering (Plotnicov and Elsasser 1961). This idea was also favored by Floyd Otter, former manager of Mountain Home State Forest, a locality with many rock basin sites who wrote numerous articles on the subject (Otter n.d., 1963, 1979a, 1979b, 1979c, 1979d). This process involves plants such as lichens or mosses, producing organic acids, plus the action of freezing water which could form saucer-like depressions. Gay Weinberger (1981:2) provided some support for this notion when she found a high acid content (primarily from oak leaves and redwood and pine needles and cones) at rock basin sites near Oriole Lake and Camp Nelson. Both Barnes (1984) and Stewart (1929) believe the chemical weathering/solution pit hypothesis is unlikely due to the shape of the basins. According to George Stewart:

> ...Pot-holes, being literally bored by rotating cobbles, tend to assume cylindrical forms and sometimes are broader at the base than the top, but seldom shaped like wash bowls; and <u>weather pits expand as a rule laterally more rapidly than downward</u> and, therefore, tend to acquire somewhat <u>irregular outlines</u> and <u>flat bottoms</u> (Stewart 1929:422).

Recently, an archeological survey, excavation, and research program was completed at Mountain Home State Forest which documented twenty-two prehistoric archeological sites (Stangl and Foster 1984; Wallace 1988; Wallace, Wallace, and Meeker 1989a). Since rock basins are common at Mountain Home, the question of their origin and possible use by the Indians was re-investigated. Wallace was unable to shed much new light on the century-old question surrounding their origin; adding that the problem may never be adequately resolved to the satisfaction of everyone (Wallace 1989b:6).

There is no doubt, however, that the Indians knew of rock basins, and sought them out as favorite camping locations. Most rock basin sites in Tulare County exhibit unmistakable evidence that prehistoric activity occurred nearby. Many rock basin sites contain bedrock mortars situated either directly adjacent or on a nearby flank of the same granite outcropping. All ten major base camps at Mountain Home State Forest are situated adjacent to rock basins and all but one contain bedrock mortars (Wallace et al. 1989a:40). The association of southern Sierran rock basins to archeological sites has long been known and added to the mystery surrounding their origin. What is becoming increasingly apparent, however, is that the Indians did indeed use them for some purpose. Just what that purpose may be has been the topic of much unfounded speculation. One person even suggested that they were used by the Indians as "stills" to brew a beer-like kind of alcoholic beverage (Phillips 1974:1). Both the brewery idea and their use as "bathtubs" can be quickly rejected. The following discussion by Wallace summaries the most likely possibilities for their use:

> ...visitors may well have placed their grinding holes around or close to basins because the latter served a useful purpose, one connected with processing plant products. The basins could have been advantageously used as bins--composed of boulders arranged in a circle--were often placed near bedrock mortars by historic Indians. Other possible usages include fire pits for burning pitch off sugar pine cones, and leaching pits for acorns. The basins are of a size and depth to have served any of these.
>
> There is no real evidence to favor any one of the suggested practices. But all the same, it can be persuasively argued that the basins did act as leaching pits, in place of the sand basins regularly used by local Indians, for removing bitter tannin from the acorns. With the bottoms lined with several inches of sand and covered with twigs to break the fall of the water, they could have served this end quite well....The ten or so applications of progressively hotter water required for leaching out tannin would have filtered down through the porous sand and been absorbed in it without flooding the pit (Wallace 1989b:4-5).

The Mountain Home State Forest archeological investigation provided at least two important contributions to the "Great Indian Bathtub Mystery." First, it set forth at least one of the time frames in which they were used. Unlike earlier speculation that they were made or used by "an ancient race of people," evidence suggests that they were used during the final prehistoric phase at Mountain Home, a period currently dated after A.D. 1200-1300 (Moratto 1984:333). All ten of the major base camps at which basins were present produced the late-prehistoric material characteristic of this time period (Wallace 1989b:6).

The second contribution to the "mystery" from the Mountain Home project concerns observations made during excavation of the Methuselah site (CA-TUL-1173), a typical southern Sierra bedrock mortar and rock basin site remarkably similar to the Salt Creek Ridge site reported here. A distinctive, dark black lense was encountered during excavations at the south edge of the rock basins. Unmistakable of intensive burning, it is quite likely this lense has something to do with the function of rock basins at such a camp.

Appendix 3

Field Notes and Catalog

By
Richard Jenkins
and
Eric Kauffman

Field Notes and Catalog

The unit summaries detail the artifacts found in each level and give the notes that were taken during field work. Unit level drawings are also provided. (A table showing the summary of artifacts recovered is shown in Figure 12).

Unit 12-C **Overburden**

2 pottery sherds (100.26)
5 stream cobble frags/flakes, 3 w/cortex (100.27)
3 obsidian waste flakes (100.28)
1 obsidian biface fragment (100.29)
1 burned bone fragment (100.30)
1 obsidian flaked tool (100.70)
1 obsidian D.S.N. "ear" (100.32)
1 probable quartzite mano fragment (100.33)
1 tin can (not collected)

Field Notes (overburden)
It appears from that the prehistoric occupants were flaking imported stream cobbles as evidenced by the recovery of large cobble flakes with cortex. The surface level was significantly

disturbed. It was loose fill pushed from the west containing midden, forest litter, and sticks. It ranged from 2-3 inches deep across the unit. Underlying this overburden is a compacted layer containing intact root systems and an occasional Incense Cedar seedling.

Unit 12-C **0-10cm**

16 pottery sherds, one rim fragment (100.1)
13 stream cobble fragments/flakes, 8 with cortex (100.2)
2 burned boned fragments (100.3)
2 pieces of quartz (100.4)
1 desert side notched point,obs.(100.5)
1 small stemmed point, obsidian (100.6)
1 biface fragment, obsidian (100.7)
20 obsidian waste flakes (100.8)
1 soapstone bowl rim fragments, decorated with incisions (100.9)
1 pebble (100.10)

Field Notes (1-10cm level)
Some loose material was encountered, especially in NE corner of unit. There may be a hearth feature showing up along east central edge of unit. Soil became more compact with depth. This is the first level excavated that we feel confident is undisturbed. The pushed midden, leaves, sticks, etc... removed from above on 9/23. A surprising ratio of finished tools (points) to flakes present. Many fine roots present.

Unit 12-C **10-20cm**

5 stream cobble frags/flakes, 4w/cortex (100.11)
4 bone fragments (100.12)
22 obsidian waste flakes (100.13)
1 quartz flake (100.14)
1 unidentified obs. point frag (100.15)
2 basalt flakes (100.16)
9 pottery sherds, including 1 rim (100.17)
1 bifacial granite mano frag w/pecking (100.18)
1 trifacial granite mano w/thumbgrip and pecking (100.19)
1 groundstone fragment, granite (100.20)

Field Notes (10-20cm level)
Bedrock was encountered in two areas. Larger roots. Two manos found along east edge of unit near milling station may be a cache. No evidence of the suspected hearth--no charcoal. Bedrock spalling off edge of buried bedrock in eastern portion of unit.

Unit 12-C **20-30cm**

4 obsidian waste flakes (100.21)
2 stream cobble frags/flakes, w/cortex (100.22)
1 large biface base (100.23)
1 pottery sherd (100.24)
1 exhausted metamorphic core (100.25)

Field Notes (20-30 level)
Many roots encountered growing along the bedrock. Unit bottomed-out on bedrock in all but the western edge. Rock spalls present along east edge. Unit abandoned after this level.

Unit 13-D **Surface**

9 obsidian waste flakes (100.34)
1 .22 caliber shell casing (100.35)
1 desert Side Notch Point,obs. (100.36)
2 pottery sherds (100.37)
1 possible metate frag, metamorphic (100.38)
2 chert waste flakes (100.39)
1 quartz flake (100.40)

1 bone fragment, burnt (100.41).
1 obsidian flaked tool (   ).

Field Notes
Unit was exposed along the western edge down to compacted-soil layer approximately 2-3 inches. Disturbed soil up to 20 cm removed from granite outcrop in bulk of unit. No milling features present. Of interest is an area of decomposing granite surface in the central-southern 1/3 of unit. The area is a two inch deep, eroded, near perfect half circle that is about two inched deep. This may be the beginning of an "Indian Bathtub." Lichens and moss indicate that this outcrop was exposed prior to fire fighting activity.

Unit 13-C **0-Bedrock**

2 pottery sherds (100.42)
2 basalt flakes (100.43)
7 obsidian flakes (100.44)
2 quartz flakes (100.45)
1 piece of quartz (100.46)

Field Notes

Unit C-13 **Overburden**

1 granite mano fragment (100.47)
7 obsidian flakes (100.48)
1 piece of serpentine (100.49)
1 piece of burnt bone, fragment (100.50)
3 stream cobble frags/flakes w/cortex (100.51)
3 pottery sherds (100.52)
1 desert Side Notched Point (100.53)

Field Notes

Unit F-6 **Surface**

1 large soapstone bowl fragment
3 sherds glued together (100.54)
5 pottery sherds (100.55)
1 burned bone fragment (100.56)
1 obsidian biface mid-section (100.57)
6 obsidian waste flakes (100.58)
1 stream cobble core/hammerstone fragment (100.59)
2 stream cobbles frags/flakes w/cortex (100.60)
2 obsidian flake tools (100.71)

Field Notes
Disturbed fill removed from upper-level of unit was excavated in

hope of finding additional fragments of the partial steatite vessel found on surface. Disturbed fill ranged from 1 inch in northeast corner to 4 inches in the northwest, 14 inches in southwest, and 3 inches in the southeast corner. Unit abandoned after reaching compacted layer suspected to be sub-midden. This unit lays within a swale cut by heavy equipment-most of the deposit was removed at that time and the fill excavated here probably came from another area on the site.

Unit B-13 **Overburden**

5 obsidian waste flakes (100.61)
1 obsidian biface fragment (100.62)
1 obsidian biface tip (100.63)
4 metamorphic flakes (100.64)
3 stream cobble fragments (100.65)
2 obsidian flake tools (100.66)

Field Notes
Southern half unexcavated to bedrock. Approximately 0-10cm of disturbed material removed from surface in northern half. Fresh unburned leaves covered the granite surface when exposed. Two shallow mortar cups and shallow milling basin exposed.

Miscellaneous Finds:

Unit D-12	**Surface**	1 obsidian waste flake (100.67)
Unit E-9	**Surface**	2 pottery sherds (100.68)
Unit G-17	**Surface**	1 large pestle (100.69)

Appendix 4

Obsidian Sourcing Analysis

By
Richard Hughes

May 30, 1990

Mr. Dan Foster, Archaeologist
California Department of Forestry and Fire Protection
P.O. Box 944246
Sacramento, CA 94244-2460

Dear Mr. Foster:

Enclosed with this letter you will find copies of two tables presenting x-ray fluorescence data generated from the analysis of 23 obsidian artifacts from archaeological sites CA-Pla-689 (n=18) and CA-Tul-472 (n=5) in Placer and Tulare Counties, California.

Laboratory investigations were performed on a Spectrace™ 5000 (Tracor X-ray) energy dispersive x-ray fluorescence spectrometer equipped with a Rh x-ray tube, a 50 kV x-ray generator, 1251 pulse processor (amplifier), 1236 bias/protection module, a 100 mHz analog to digital converter (ADC) with automated energy calibration, and a Si(Li) solid state detector with 150 eV resolution (FWHM) at 5.9 keV in a 30 mm^2 area. The x-ray tube was operated at 35.0 kV, .30 mA, using a .127 mm Rh primary beam filter in an air path at 200 seconds livetime to x-ray intensity data for elements zinc (Zn), gallium (Ga), rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr) and niobium (Nb). Barium (Ba) intensities were generated by operating the x-ray tube at 50.0 kV, .35 mA, with a .63 mm copper (Cu) filter at 300 seconds livetime. Iron vs. manganese (Fe/Mn) ratios were computed from data generated by operating the x-ray tube at 12.0 kV, .30 mA, with a .127 mm Al filter in an air path at 400 seconds livetime. X-ray intensities were converted to concentration estimates employing a least-squares calibration line established for each element from analysis of up to 26 international rock standards certified by the U.S. Geological Survey, the U.S. National Institute of Standards and Technology (formerly National Bureau of Standards), the Geological Survey of Japan, and the Centre de Recherches Petrographiques et Geochimiques (France). Data processing for all analytical subroutines is executed by a Hewlett Packard Vectra™ microcomputer, with operating software and analytical results stored on a Hewlett Packard 20 megabyte fixed disk. Further details pertaining to x-ray tube operating conditions and calibration appear in Hughes (1988a).

All trace element values on the tables are expressed in quantitative units (i.e. parts per million [ppm] by weight), and these were compared directly to values for known obsidian sources that appear in Bowman et al. (1973), Hughes (1983, 1985, 1986, 1988a, 1989), Jack (1976), and Jackson (1989). Artifacts were assigned to a parent obsidian type if diagnostic trace element concentration values (i.e., ppm values for Rb, Sr, Y, Zr and, where appropriate, Ba) corresponded at the 2-sigma level. Stated differently, artifact-to-obsidian source (geochemical type) matches were considered reliable if diagnostic mean measurements for artifacts fell within 2 standard deviations of mean values for source standards. The term "diagnostic" is used here to specify those trace elements that are well-measured by x-ray fluorescence, and whose concentrations show low intra-source variability and marked variability across sources. Diagnostic elements, then, are those whose concentration values allow one to draw the clearest geochemical distinctions between sources. Although Zn and Ga ppm concentrations also were measured and reported for each specimen, they are not considered "diagnostic" because they don't usually vary significantly across obsidian sources (see Hughes 1982, 1984). This is particularly true of Ga, which occurs in concentrations between 10-30 ppm in nearly all sources in the study area. Zn ppm values are

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always high in Zr-rich, Sr-poor peralkaline volcanic glasses (like those in northwestern Nevada, where concentrations are >150 ppm), but otherwise they do not vary dramatically between sources.

The trace elemental composition measurements presented in the enclosed tables are reported to the nearest ppm to relect the resolution capabilities of non-destructive energy dispersive x-ray fluorescence spectrometry. The resolution limits of the present x-ray fluorescence instrument for the determination of Zn is about 3 ppm; Ga about 2 ppm; for Rb about 5 ppm; for Sr about 3 ppm; Y about 2 ppm; Zr about 4 ppm; and for Nb about 3 ppm. When counting and fitting error uncertainty estimates (the "±" value in the table) for a sample are greater than calibration-imposed limits of resolution (e.g. the 6 ppm value for Rb in specimen 689-17 which slightly exceeds the 5 ppm detection limit value), the larger number is preferred as a more conservative, robust reflection of elemental composition and measurement error due to variations in sample size, surface and x-ray reflection geometry (see Hughes 1988).

The obsidian source attribution for each specimen appears on the data tables. As you can see, 13 of 18 samples submitted from Pla-689 conform to the Bodie Hills trace element "signature", two match the Napa Valley (*sensu* Jackson 1989) source-area profile, one specimen was fashioned from volcanic glass of the Queen geochemical type (corroborated by an Fe/Mn ratio value of 12.8; cf. Hughes [1983: Table 78]), and two match the trace element composition obsidian from Sutro Springs, Nevada. The latter nodule source, located about 18 miles northeast of Carson City just north of U.S. Highway 50 near the Storey-Lyon County line, also has been identified archaeologically at CA-Nev-251 (Hughes 1987) and at CA-Pla-664 (Hughes 1988b). All five artifacts from CA-Tul-472 match the geochemical profile of obsidians of the West Sugarloaf variety in the Coso volcanic field (cf. Hughes 1988a).

I hope this information will help in your analysis and interpretation of these site materials. Please contact me at my laboratory (phone: [916] 364-1074) if I can provide further assistance or information. As you requested, I have forwarded these specimens to Mr. Tom Origer for obsidian hydration analysis.

Sincerely,

Richard E. Hughes

Richard E. Hughes, Ph.D.

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Trace Element Concentrations

Specimen Number	Zn	Ga	Rb	Sr	Y	Zr	Nb	Obsidian Source (Chemical Type)
689-1	35 ±5	12 ±3	164 ±5	90 ±3	14 ±2	94 ±4	15 ±3	Bodie Hills
689-2	62 ±6	17 ±3	159 ±5	99 ±3	30 ±2	124 ±4	12 ±3	Bodie Hills
689-3	42 ±6	21 ±3	194 ±5	98 ±3	12 ±2	104 ±4	16 ±4	Bodie Hills
689-4	39 ±6	13 ±3	183 ±5	90 ±3	14 ±2	97 ±4	13 ±3	Bodie Hills
689-5	44 ±5	14 ±3	178 ±5	94 ±3	13 ±2	95 ±4	16 ±3	Bodie Hills
689-6	48 ±5	14 ±3	153 ±5	80 ±3	20 ±2	74 ±4	21 ±3	Sutro Springs, Nevada
689-7	47 ±7	20 ±3	191 ±6	96 ±3	13 ±2	98 ±4	13 ±4	Bodie Hills
689-8	36 ±6	12 ±3	189 ±5	93 ±3	14 ±2	107 ±4	18 ±3	Bodie Hills
689-9	65 ±5	14 ±3	187 ±5	3 ±3	45 ±2	227 ±4	12 ±3	Napa Valley
689-10	40 ±5	15 ±3	176 ±5	94 ±3	15 ±2	95 ±4	17 ±3	Bodie Hills
689-11	48 ±6	15 ±3	188 ±5	102 ±3	15 ±2	102 ±4	16 ±4	Bodie Hills
689-12	40 ±6	16 ±3	201 ±5	105 ±3	14 ±2	105 ±4	16 ±3	Bodie Hills
689-13	42 ±7	17 ±4	203 ±6	106 ±3	12 ±2	101 ±4	19 ±4	Bodie Hills
689-14	46 ±6	18 ±3	147 ±5	76 ±3	19 ±2	77 ±4	21 ±4	Sutro Springs, Nevada
689-15	39 ±5	13 ±3	186 ±5	97 ±3	14 ±2	100 ±4	17 ±3	Bodie Hills
689-16	43 ±5	15 ±3	192 ±5	95 ±3	14 ±2	104 ±4	16 ±3	Bodie Hills

Trace element values in parts per million (ppm); ± = pooled expression (in ppm) of x-ray counting uncertainty and regression fitting error at 200 seconds livetime. Samples with "689- " prefixes are from CA-Pla-689; those with "100- " prefixes are from CA-Tul-472.

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Trace Element Concentrations

Specimen Number	Zn	Ga	Rb	Sr	Y	Zr	Nb	Obsidian Source (Chemical Type)
689-17	77	20	208	18	22	137	32	Queen
	±	±4	±6	±3	±2	±4	±4	
689-18	70	16	184	3	46	226	14	Napa Valley
	±6	±4	±5	±3	±2	±5	-±4	
100-5	67	20	231	8	50	149	40	West Sugarloaf,
	±6	±4	±6	±3	±2	±4	±4	Coso Volcanic Field
100-6	60	24	282	5	59	147	53	West Sugarloaf,
	±6	±3	±6	±3	±2	±4	±4	Coso Volcanic Field
100-23	59	24	263	6	56	138	49	West Sugarloaf,
	±5	±3	±5	±3	±2	±4	±3	Coso Volcanic Field
100-36	74	24	268	5	57	136	49	West Sugarloaf,
	±7	±4	±6	±3	±3	±5	±4	Coso Volcanic Field
100-53	64	25	261	7	58	149	46	West Sugarloaf,
	±7	±4	±6	±3	±2	±4	±4	Coso Volcanic Field

Trace element values in parts per million (ppm); ± = pooled expression (in ppm) of x-ray counting uncertainty and regression fitting error at 200 seconds livetime. Samples with "689- " prefixes are from CA-Pla-689; those with "100- " prefixes are from CA-Tul-472.

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Appendix 5

Obsidian Hydration Analysis

By
Thomas Origer

SONOMA STATE UNIVERSITY
ACADEMIC FOUNDATION, INC.

ANTHROPOLOGICAL STUDIES CENTER
CULTURAL RESOURCES FACILITY
707 664-2381

Dan Foster, Archaeologist
California Division of Forestry
1416 9th Street, Room 1516-22
Sacramento, CA 95814

July 5, 1990

Dear Dan:

This letter reports hydration measurements obtained from 21 specimens from two sites: CA-PLA-689 and CA-TUL-472. This work was performed as part of an agreement with Sacramento State University.

The analysis was completed at the Sonoma State University Obsidian Hydration Laboratory, an adjunct of the Anthropological Studies Center, Department of Anthropology. Procedures used by our hydration lab for thin section preparation and hydration band measurement are described below.

The specimens were examined in order to find two or more surfaces that would yield edges which would be perpendicular to the microslides when preparation of the thin section was completed. Two small parallel cuts were made at an appropriate location along the edge of each specimen with a 4 inch diameter circular saw blade mounted on a lapidary trimsaw. The cuts resulted in the isolation of a small sample with a thicknesses of approximately one millimeter. Samples were removed from the specimens and mounted with Lakeside Cement onto permanently etched petrographic microslides.

The thickness of each sample was reduced by manual grinding with a slurry of #500 silicon carbide abrasive on a glass plate. The grinding was completed in two steps. The first grinding was terminated when the sample's thickness was reduced by approximate 1/2, thus eliminating any micro-chips created by the saw blade during the cutting process. The slides were then reheated, which liquified the Lakeside Cement, and the samples inverted. The newly exposed surfaces were then ground until the proper thickness was attained.

The correct thin section thickness was determined by the "touch" technique. A finger was rubbed across the slides, onto the samples, and the difference (sample thickness) was "felt." The second technique employed for arriving at proper thin section thickness is termed the "transparency" test. Each microslide was held up to a strong source of light and the translucency of the thin section observed. The sample was sufficiently reduced in thickness when the thin section readily allowed the passage of light.

A protective coverslip was affixed over the thin sections when all grinding was completed. The completed microslides are curated at our hydration lab under File No. 90-H923.

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1801 East Cotati Avenue Rohnert Park, California 94928

The hydration bands were measured with a strainfree 40 power objective and a Bausch and Lomb 12.5 power filar micrometer eyepiece on a Nikon petrographic microscope. Six measurements were taken at several locations along the edge of the thin sections. The mean of the measurements was calculated and given on the enclosed table. These hydration measurements have a range of +/- 0.2 due to normal limitations of the equipment.

If you have questions regarding this hydration work, please do not hesitate to contact me.

Cordially,

Thomas M. Origer, Director
Obsidian Hydration Laboratory

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CA-PLA-689		Submitted by: Dan Foster - CDF					June 1990
Lab#	Catalog#	Description	Provenience	Remarks	Readings	Mean	Source
01	689-1	flake tool	surface	none	6.1 6.1 6.3 6.3 6.4 6.6	6.3	
02	689-2	debitage	Unit 1/0-10	none	1.7 1.7 1.7 1.7 1.8 1.8	1.7	
03	689-3	flake point	Unit 1/10-20	none	1.6 1.7 1.7 1.8 1.8 1.8	1.7	
04	689-4	flake point?	Unit 1/10-20	none	1.7 1.8 1.8 1.8 1.8 1.8	1.8	
05	689-5	debitage	Unit 1/20-30	none	4.9 4.9 5.0 5.0 5.0 5.0	5.0	
06	689-6	flake point?	Unit 1/30-40	none	2.3 2.3 2.4 2.4 2.5 2.6	2.4	
07	689-7	point base?	Unit 1/40-50	none	2.4 2.4 2.4 2.5 2.5 2.6	2.5	
08	689-8	point base?	Unit 1/40-50	none	6.1 6.1 6.1 6.2 6.3 6.3	6.2	
09	689-9	biface fragment	Unit 1/50-60	none	2.3 2.3 2.3 2.4 2.4 2.6	2.4	
10	689-10	debitage	Unit 1/50-60	none	6.1 6.1 6.1 6.1 6.2 6.3	6.2	
11	689-11	flake point	Unit 1/60-70	none	1.6 1.6 1.7 1.7 1.7 1.8	1.7	
12	689-12	debitage	Unit 1/70-80	none	3.0 3.0 3.0 3.1 3.2 3.2	3.1	
13	689-13	flake point	Unit 1/80-90	none	1.6 1.6 1.7 1.7 1.7 1.7	1.7	
14	689-14	point base	Unit 1/80-90	none	1.3 1.4 1.4 1.6 1.6 1.6	1.5	
15	689-15	debitage	Unit 1/90-100	none	3.0 3.0 3.0 3.0 3.1 3.1	3.0	
16	689-16	debitage	Unit 1/100+	none	3.9 4.1 4.1 4.1 4.1 4.2	4.1	

Lab Accession No.: 90-H923 Technician: Thomas M. Origer

CA-TUL-472		Submitted by: Dan Foster - CDF					June 1990
Lab#	Catalog#	Description	Provenience	Remarks	Readings	Mean	Source
17	100-5	DSN	Unit 12c/0-10	none	2.5 2.6 2.6 2.6 2.6 2.6	2.6	
18	100-6	stemmed point	Unit 12c/0-10	none	1.4 1.4 1.4 1.6 1.6 1.7	1.5	
19	100-23	biface fragment	Unit 12c/20-30	none	1.1 1.2 1.2 1.2 1.3 1.4	1.2	
20	100-36	DSN	Unit 13d/overburden	none	1.2 1.3 1.3 1.3 1.3 1.3	1.3	
21	100-53	DSN	Unit 13c/0-bedrock	none	2.4 2.4 2.4 2.4 2.5 2.5	2.4	

Lab Accession No.: 90-H923 Technician: Thomas M. Origer